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Implementing electronic data interchange (EDI) with small business suppliers in the pre-award acquisition process

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THESIS

IMPLEMENTING ELECTRONIC DATA INTERCHANGE
(EDI) WITH SMALL BUSINESS SUPPLIERS
IN THE PRE-AWARD ACQUISITION PROCESS

by

Robert B. Sergeson

June, 1993

Principal Advisor: Myung W. Suh

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This thesis examines the implementation of electronic data interchange (EDI) with small business suppliers in the pre-award acquisition process. The general history and concept of EDI is discussed along with the pre-award acquisition process. The results of a small business survey are analyzed to provide insight on the barriers and impediments to implementing EDI with small business concerns. Additionally, interviews and discussions with major corporations were conducted to identify common lessons learned by these corporations in their efforts to implement EDI with their small business supplier base.

The major conclusion drawn is that DoD can successfully implement EDI with its small business supplier base in the pre-award acquisition process. It was determined that the following key factors are crucial to successful implementation of EDI with small business: 1) provide effective training; 2) specifically direct grant funding to the Procurement Technical Assistance Centers; 3) require the Small Business Administration to aggressively sponsor and implement EDI training; 4) draft legislation to modify or eliminate restrictive laws and regulations; and 5) foster the use of Value-Added Networks, Trading Partner Agreements, and EDI Service Bureaus. These efforts would provide the basic infrastructure to enable DoD to train, nurture, and help problem solve with small businesses once DoD becomes totally reliant upon EDI.

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Implementing Electronic Data Interchange
(EDI) with Small Business Suppliers
in the Pre-Award Acquisition Process

by

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Lieutenant Commander, United States Navy
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Submitted in partial fulfillment
of the requirements for the degree of

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from the

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ABSTRACT

This thesis examines the implementation of electronic data interchange (EDI) with small business suppliers in the pre-award acquisition process. The general history and concept of EDI is discussed along with the pre-award acquisition process. The results of a small business survey are analyzed to provide insight on the barriers and impediments to implementing EDI with small business concerns. Additionally, interviews and discussions with major corporations were conducted to identify common lessons learned by these corporations in their efforts to implement EDI with their small business supplier base.

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I would like to thank my wife, Cathy, for her understanding, support, and encouragement during this lengthy thesis project.

I. INTRODUCTION

A. BACKGROUND

> Consistent with our commitments to improve productivity
> and move toward a paperless environment, all DoD
> components should make maximum use of electronic data
> interchange (EDI) for the paperless processing of all
> business-related transactions. [Ref. 1:p. 1]

Electronic Data Interchange (EDI) is the application-to-application exchange of electronic business documents in a common format. EDI converts the time-consuming and repetitive process of manually handling large volumes of standard business documents into an instantaneous, single-entry exchange of digital information. The Department of Defense's goal is not only to realize the direct and indirect savings associated with the usage of EDI, but more importantly, use EDI as a catalyst to fundamentally change its business practices and procedures. Deputy Secretary of Defense Taft directed the Assistant Secretary of Defense for Production and Logistics Torelli to establish an orderly and timely "acceptance of EDI as the normal way of doing business with DoD by the early 1990's." [Ref. 1:p. 1] DoD has named this initiative "Electronic Commerce through EDI."

Consistent with the DoD initiative to implement EDI with industry, participation of small businesses in the pre-award acquisition process is considered crucial in moving towards a

paperless, electronic environment. In Fiscal Year 1988, approximately 98% of all contractual obligations entered into by DoD involved simplified purchase procedures. [Ref. 2:p. 2-3] Pursuant to the Small Business Act, 15 U.S.C. 631, the use of simplified purchase procedures requires that an acquisition of less than $25,000 be exclusively restricted to a qualified small business supplier. Additionally, many of the contracts in excess of $25,000 utilize small business suppliers as the prime contractor or as a subcontractors. It is estimated that many major weapon systems contracts awarded to large defense manufacturers are sub-contracted, as much as 50-60% of the production effort, to small business suppliers. As such, small business suppliers make up a significant and valuable portion of the defense industrial base as follows:

> Small businesses are a vital element in our national defense. We want them to participate in defense contracting and have their fair share of our market. We want them to prosper and grow. They are the lifeblood of our free enterprise system. [Ref. 3:p. 13]

In order to conduct business with DoD, business communication has, until recently, been accomplished through the use of paper documents. To replace the tremendous volume and flow of paperwork associated with the pre-award acquisition process, electronic commerce is being integrated with EDI through electronic bulletin boards, electronic brokers, and other electronic techniques to encompass all DoD business functions. As a result of private industry's and DoD's efforts, businesses that are now EDI capable have grown

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significantly over the past several years from 5,000 in 1989 to over 12,200 current listings in the EDI Yellow Pages. By 1996 it is estimated that 22,000 firms will become EDI capable and join the electronic marketplace [Ref. 4:p. 6].

This thesis will explore the issues surrounding DoD's implementation of EDI with small businesses in the pre-award acquisition process.

B. OBJECTIVE AND RESEARCH QUESTIONS

This thesis will explore the issues surrounding DoD's successfully implementing the use of Electronic Commerce/ Electronic Data Interchange (EC/EDI) with small business suppliers in the pre-award acquisition process. My objective will be to discuss and analyze the key factors relating to the above issues and provide recommendations to aid in DoD's successful implementation of EDI with small businesses.

The primary research question is how can DoD successfully implement the use of EC/EDI with small business suppliers in the pre-award acquisition process. Subsidiary questions include:

- What is EDI and what are the current applications with small businesses?

- What is the range of pre-award acquisition activities to which EDI can be applied?

- How do large corporations utilize EDI with small business sub-suppliers and what lessons learned can be applied to DoD implementation of EDI?

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- What are the significant barriers to improve a full range of pre-award acquisition activities through use of EDI?

- What actions can be taken to eliminate or reduce these barriers?

- What steps can be taken to enhance the use of EDI in the pre-award acquisition environment?

C. METHODOLOGY

The methodology of this thesis research included a comprehensive literature search and examination of current documentation surrounding EDI, small businesses and the pre-award acquisition process. Additionally, interviews were conducted with numerous DoD civilians and military personnel as well as personnel from private industry. Those interviews represent various levels of contract acquisition, i.e., acquisition policy, contracting personnel, EDI researchers, implementors, etc.

An exhaustive review of current literature was performed on EDI. This literature review involved conducting several computer data base searches including; 1) Computer Select; 2) Defense Logistics Studies Information Exchange; 3) Defense Technical Information Center; and 4) National Technical Information System.

A research survey was conducted of 375 small business contractors to determine their current level of EDI acceptance, implementation barriers and impediments, and steps that can be taken to reduce these barriers.

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Interviews were also conducted with personnel from several large private corporations that have developed and implemented an EDI business strategy for the purpose of addressing the following questions:

- How have these corporations required small business suppliers to adopt EDI?

- How successful have they been in their efforts to have small business suppliers adopt EDI?

D. LIMITATIONS AND ASSUMPTIONS

1. Limitations

The basis of this thesis is an intensive six-month study of EDI and its applicability with small businesses in the pre-award acquisition process. This thesis will not discuss the numerous technical issues surrounding the actual programming of EDI bridging, translation, and management software. Rather, it will concentrate on the barriers and impediments of successfully implementing EDI with small business suppliers in the pre-award acquisition process.

2. Assumptions

Even though Chapters II and III provide a discussion of EDI and the pre-award acquisition process, the researcher assumes the reader is familiar with the basic tenets of EDI and the Federal Acquisition Regulation (FAR). A reader who is not familiar with the Federal acquisition process will have to refer elsewhere for an in-depth explanation of the theory, principles, and regulatory basis for current practices.

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The benefits of this study will be the additional information obtained in successfully implementing EDI with small business suppliers. This will prove useful in the development of current as well as future policy.

E. ORGANIZATION OF THE STUDY

This research effort is organized into eight chapters. Chapter I provides an introduction to the subject matter. Chapter II defines EDI, Small Business Supplier, Computer Aided Acquisition and Logistic Support (CALS); and discusses the historical development of EDI. Chapter III provides a discussion of DoD's pre-award acquisition process and EDI's application. Chapter IV discusses the barriers to EDI implementation. Chapter V presents the researcher's findings from surveying 375 small businesses. Chapter VI presents interviews and discussions with large corporations that have incorporated small businesses into their EDI business strategy. Chapter VII provides an analysis of the researcher's results and the barriers/impediments to EDI implementation. Lastly, Chapter VIII, presents the researcher's final recommendations.

II. ELECTRONIC DATA INTERCHANGE DEVELOPMENT

A. INTRODUCTION

The purpose of this chapter is twofold: First, a discussion to define: a) what is EDI?; b) what is a small business supplier?; and c) what is CALS?; Second, a general discussion on the historical background of EDI and its development within DoD.

B. DEFINITIONS

1. What is EDI?

EDI has been called the "key to paperless communications." [Ref. 5:p. 69] Simply stated, EDI is the process of electronically transferring formatted business transactions in a standard format from one organization's computer to another. [Ref. 6:p. 2] EDI is a form of electronic communication that allows trading partners in one or more organizations to exchange business data in structured formats that can be processed by application software; enhancing the productivity and effective use of timely and accurate business information.

EDI is often confused with Electronic Mail (E-Mail), yet the two computer technologies are quite different. The most significant difference between EDI and E-Mail is that EDI is intended for direct application-to-application computer

processing; whereas E-Mail messages must be physically read and manually processed in order to complete the transaction. Additionally, some people define EDI to encompass all forms of electronic communication such as facsimile (FAX), electronic funds transfer (EFT), and other proprietary data formats. E-Mail, FAX, EFT, and other proprietary data formats utilizing EDI are sometimes referred to as "lower case EDI." [Ref. 6:p. 2]

2. What is a Small Business Supplier?

A Small Business Supplier is an organization that is typically "independently owned and operated and is not dominant in its field of operations." [Ref. 7:p. 3] The Small Business Act was created to provide certain contracting preferences to small business concerns and small business suppliers owned and controlled by socially and economically disadvantages individuals. The Small Business Act, Public Law 85-536, 72 Stat. 384 was codified in 1963 under 15 U.S.C. 631. As defined by the Small Business Act, the Small Business Administration (SBA), was created to implement, define, and promote small business participation with the Government.

The SBA defines the qualification requirements that a small business supplier must possess in order to be classified as a small business. Depending upon the type of industry involved, an organization is defined by the SBA as a small

business concern if they meet certain dollar value or number of employees thresholds.

3. What is CALS?

The objective of CALS is to 1) create data only once; 2) provide on-line access to data; and 3) build technical and management infrastructures. CALS and EDI are closely related, and together form an enabling technology for a paperless business environment. Current EDI transaction sets allow the transfer of CALS data. EDI as the information hub enables CALS to provide continual process improvement to the entire life-cycle of a major weapons system program and integrates the weapons system data base (see Figure 1).
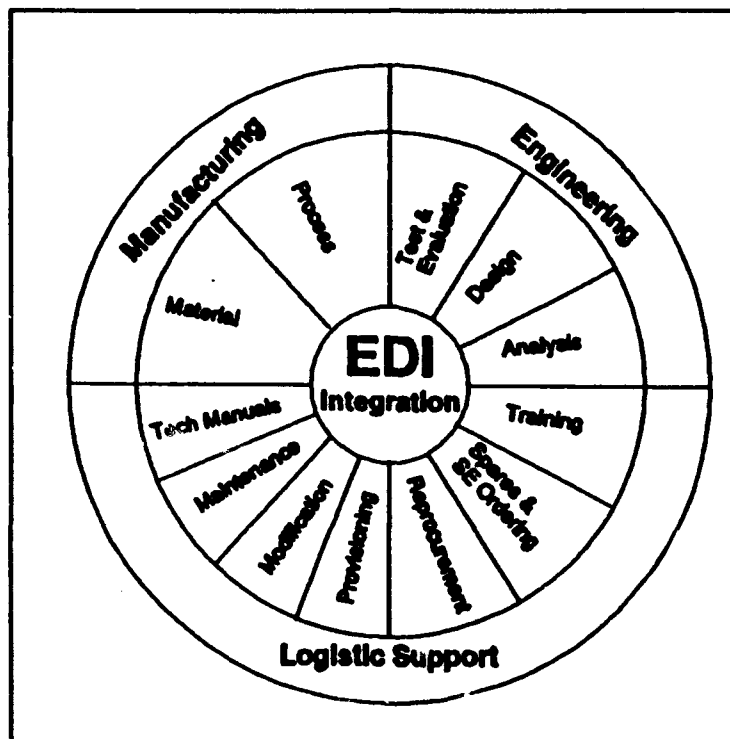
Figure 1. EDI - The Information Hub
Source: Supply Tech, Inc.

CALS is a joint DoD and industry strategy for the transition from paper-intensive processes to highly automated integrated methods of weapon systems acquisition, design, manufacturing and life cycle support. [Ref. 8:p. 149] The overall intent of CALS is to improve systems acquisition, product support, efficiency, and quality. The CALS target is an integrated information environment that will enable continuous process improvement through the use of digital information. Cost savings achieved through streamlining the technical and business documentation normally associated with a major weapons system acquisition which eventually flow down to the small business supplier.

CALS will shift the current interchange of paper reports, technical drawings, change requests, etc. to an electronic, digital medium. EDI and CALS has many applications with small business suppliers in the acquisition pre-award process. One impact of EDI on industry and DoD is the requirement to utilize CALS in all major weapon systems acquisitions. [Ref. 9:p. 6-N-1] As such, EDI has a logical and strategic role as a catalyst for further automation of CALS.

C. HISTORICAL BACKGROUND

Electronic commerce is the end-to-end digital exchange of business information that is enabled by EDI. Electronic commerce is enabled by EDI and is being used as a catalyst for

a management approach embracing continuous process improvement. EDI is moving businesses from a paper-based domain to one that is solely based on electronic transactions. As the amount and complexity of information being exchanged within industry and the Government has increased, so too has the requirement to transfer these data in a more efficient and economical manner.

In the mid-1950's, a computer-to-computer information exchange system began within DoD and many large private companies. [Ref. 10:p. 1.0.2] DoD used its unique electronic formats to ensure inter-operability of its logistical systems such as MILSTRIP, MILSTRAP, and MILSTAMP. As a result, DoD and many large corporations using proprietary systems were limited to electronic communication within their organization or industry.

Due to the many different formats of EDI, expansion of EDI across industry lines and within the Government was seen expensive and time consuming. Therefore, EDI standards were developed by the American National Standards Institute (ANSI), to provide a public data format to exchange information across multiple industry lines as well as DoD.

1. Standards

Standardization of data formats is fundamental to EDI. The first commercial EDI standards were developed in 1968 by the Transportation Data Coordinating Committee (TDCC) for the

rail, motor, air, and ocean industries. The success of those standards led other industry groups to seek TDCC's assistance in creating certain industry standards, most notably the grocery, automotive, warehousing, and chemical industries. [Ref. 11:p. 63] Additionally, in the mid-1970's many DoD organizations established EDI projects that utilized commercial EDI standards developed by TDCC.

> These commercial standards eliminate the need to create special software to receive or send user-unique data formats. Instead, one software package designed to generate and interpret standard formats can be used to exchange information with all trading partners. [Ref. 9:p. 1.0.3]

In the mid 1970's, ANSI recognized the need to develop generic standards that cut across industry boundaries. The purpose of ANSI is to integrate any new standards or revisions into a generic format for use both nationally and internationally. In 1979, ANSI created the Accredited Standards Committee (ASC X12) to develop EDI standards that could cut across industry boundaries to electronically interchange digital business transactions. The benefits of developing industry-wide ANSI ASC X12 EDI standards allow almost any business document to be translated into an EDI format.

The standards developed by the ASC X12 in 1979 included the technical documentation describing transactions sets,[1] data segment directories, data element dictionaries,

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[1] A transaction set is one complete business document.

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code sets, and interchange control structure. [Ref 10:p. 1.0.11] It was not until 1983 that initial transaction sets developed by ASC X12 were approved by ANSI for widespread use within industry. As of January 1993, there are currently twenty-six approved ANSI ASC X12 transactions sets covering the areas of acquisition, shipping, transportation, and financial services. With the multitude and variety of transaction sets available, virtually any organization can take advantage of EDI technology.

In parallel with the ASC X12 standards are the United Nations' standards for EDI: EDI for Administration, Commerce, and Transport, (EDIFACT). Currently, ASC X12 standards are being used more extensively in North America than EDIFACT standards. In September 1991, the U. S. Department of Commerce officially required the Government to use either ASC X12 or EDIFACT standards [Ref. 12:p. 1]; this resulted from EDIFACT's wider international recognition and acceptance. DoD's utilization and implementation of EDI has recently begun to expand on a wide scale.

2. DoD's Implementation of EDI

On May 24, 1988, Deputy Secretary of Defense Taft directed that DoD join the private sector as a full trading partner in EDI and make "maximum use of EDI for the paperless processing of all business-related transactions." [Ref. 1:p. 1] Additionally, Deputy Secretary of Defense Taft directed

that DoD utilize the ANSI X12 standards for conducting EDI transactions.

On May 7, 1990, Deputy Assistant Secretary of Defense (Production Resources) Torelli designated the Defense Logistics Agency (DLA) as the Executive Agent for Electronic Commerce/EDI within DoD. In June 1990, DLA established an executive agent plan of action to integrate defense components and maintain standardized systems and procedures for EDI implementation within DoD. Each DoD component is responsible for identifying current and planned initiatives, mapping interfaces with related systems, and operating EDI at its respective sites. EDI is considered an integral part of DoD's effort to streamline and restructure current business practices as follows:

> Electronic data interchange is just one way the DoD is improving the way it operates. OSD management considers EDI a part of the Corporate Information Management, (CIM), initiative. CIM is restructuring the DoD's information processing environment by replacing Service-unique systems for payroll, logistics, and other support functions with standards and applications...Besides EDI, CIM also includes Computer-Aided Acquisition and Logistics Support (CALS). The CALS initiative promotes the paperless exchange of technical information during the development and operation of a weapon system. In many cases, exchanges of technical information complement the business transactions supported by EDI. Another initiative related to EC and EDI is Total Quality Management (TQM). This initiative focuses on changing the business processes to improve worker productivity and quality. As stated above, such changes are required to fully exploit EDI technology. [Ref. 13:p. 1-7]

On November 12, 1991, DoD's implementation of EDI systems was further accelerated by the Defense Management

Review Decision 941, (DMRD 941), "Implementation of Electronic Data Interchange in DoD." [Ref. 14,p. 1] The thrust of DMRD 941 was to achieve full operational EDI capabilities at the earliest possible date.

Beginning in FY'92, DMRD 941 programmed budget and end strength cuts into each military department and DLA. The cost reductions reflect the direct savings projected with the use of EDI transactions. By replacing 16 commonly used business documents, with their electronic equivalent, DoD will save $1.7 Billion over a 13-year period. [Ref. 15:p. 2-17] Table I identifies the 16 ANSI X12 transaction sets targeted for initial implementation within DoD along with other transaction sets being considered for implementation and their associated titles.

DMRD 941 provides DoD with $85 million for a multi-year total investment in hardware, operators, maintenance, systems development, and engineering to achieve EDI capability. There are currently dozens of EDI projects, in each military service, implementing EDI technology from electronic order placement to transfer of technical specifications.

Table I. ANSI X12 TRANSACTION SETS

Transaction Identification Number	Transaction Titles
511	Requisition
805	Contract Pricing Proposal
810	Invoice
820	Payment Order/Remittance Advice
832	Price Sales Catalog
840	Request for Quotations
841	Specifications/Technical Information
843	Response to Request for Quotations
846	Inventory Advice
848	Material Safety Data Sheets
850	Purchase Order
855	Purchase Order Acknowledgement
856	Shipment Notice/Manifest
858	Shipping Information
859	Freight Invoice
860	Purchase Order Change
861	Receiving Advice
862	Shipping Schedule
865	Purchase Order Change Acknowledgement
869	Order Status Inquiry
870	Order Status Report
997	Functional Acknowledgement
Source: Developed by researcher.	

The next chapter will discuss the various aspects of DoD's pre-award acquisition process and EDI's role in that process.

III. DoD'S PRE-AWARD PROCESS AND EDI

A. INTRODUCTION

The purpose of DoD's pre-award acquisition process is to provide a basic framework to acquire, lease, rent, or obtain supplies and services from non-Government sources. The steps in the pre-award acquisition process begin with the initial determination of a need for supplies or services followed by: 1) selection of an appropriate contract type; 2) maximization of competition within the marketplace; 3) solicit responsible sources for the needed material; 4) conduct a comprehensive evaluation of responsive proposals/quotations on an impartial basis; 5) selection of the source that can best meet the stated requirements; and 6) award of the contract. The pre-award acquisition system created within the Government to monitor this process is controlled by regulations.

Regulations play a key role in Government acquisition and especially with small businesses due to their political interest and socio-economic preferences mandated by law. As such, the FAR implemented in 1984 is the basic policy for DoD's pre-award acquisition process. Supplementing the FAR are various FAR supplements, agency directives ard instructions. Many of these regulations and instructions were the result of Executive Orders, Federal laws, and statutes

legislated by Congress. The focus of this chapter will be on the various types of contracting available in the pre-award acquisition process and their application to EDI technologies.

B. THE PRE-AWARD ACQUISITION PROCESS

There are two basic methods of contracting that determine which type of pre-award acquisition procedures to follow within DoD: 1) simplified purchase procedures for contract values less than $25,000, and 2) sealed bidding and competitive negotiation for contract awards greater than $25,000. The following paragraphs will briefly discuss each of these methods and the applicability of EDI within these contracting types.

1. Simplified Purchase Procedures

The simplified purchase procedure is intended to reduce administrative costs and improve opportunities for small business suppliers to obtain Government contracts. Simplified purchase procedures, also known as "Small Purchase" is restricted to the acquisition of supplies and services in the amount of less than $25,000. The contracting officer is required to set-aside all small purchases for small business suppliers. [Ref. 16:p. 13.105] The usual methods of making contract awards using small purchase procedures include the purchase order, blanket purchase agreement call order, and imprest fund order.

a. EDI and Simplified Purchase Procedures

The less formal and simplified acquisition procedures available through small purchase procedures allow EDI and automated purchasing operations to more effectively integrate into the pre-award process. Small purchase procedures in the pre-award process typically involve the high-volume usage of standard documents on a repetitive basis. In FY'88, 98% of all contract awards within DoD were awarded using small purchase techniques. [Ref. 2:p. 2-4] By integrating EDI into the small purchase pre-award acquisition process, procurement automation can facilitate changes in information flows, management review, coordination, award processing, and document distribution. This fundamental change to the pre-award acquisition process is enabled by EDI as follows:

> The very structure of the pre-award process may now change with, for example, solicitations being made through electronic bulletin boards. Solicitation mailing lists and their rotation may now become obsolete. The labor-intensive procedure of telephoning quotations or manual preparation of solicitation packages could be eliminated. The Electronically Assisted Solicitation Exchange (EASE) project at the Naval Supply Center, Jacksonville, is an example of how technology stimulates procurement process change. EASE has eliminated the practice of rotating RFQs among suppliers...When an RFQ is posted on electronic bulletin board, it may generate many more than three quotations, thereby increasing small business opportunities, stimulating competition, and reducing prices. [Ref. 2:p. 2-3]

It is estimated that by integrating only the standard EDI purchase order transaction set into the pre-award process, a direct cost savings of $36.9 million could be

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achieved by DoD over a ten year period. [Ref. 14:p. 4] As such, implementation of EDI with small businesses has tremendous cost advantages and can greatly reduce the effort needed for small firms to do business with DoD. Additionally, EDI capabilities may have a more positive effect on small businesses than large firms, for such companies may have had fewer resources than larger firms to overcome these costs of doing business with DoD. Purchases involving high-volume, repetitive needs are also available using the formal advertising method of contracting.

2. Sealed Bidding and Competitive Negotiation

The conditions for utilization of sealed bidding and competitive negotiation requires that the contract award amounts be greater than $25,000. The following paragraphs will discuss each of these methods.

a. Sealed Bidding

Sealed bidding is a method of contracting that utilizes Invitation for Bids (IFB) to solicit competitive bids from responsive and responsible contractors. Sealed bidding should be used when the following conditions exist:

- Adequate time exists to solicit, receive, and evaluate sealed bids;

- Award will be made on the basis of price and other price-related factors;

- The Government's invitation for bid must be able to describe the requirements of the Government to the point where it will not be necessary to conduct further communications with the prospective offeror beyond the information offered in the invitation for bid; and

- The Government expects to receive more than one sealed bid. [Ref. 17:p. 6.401]

The IFB must clearly communicate the Government's minimum needs, without requiring any further discussions, and utilize the uniform contract format. IFB's must be publicized through distribution to prospective bidders, posting in public places, publication of a synopsis in the Commerce Business Daily (CBD) and any other means available (e.g., electronic billboards) in order to maximize competition. Upon receipt of sealed bids, a public opening of bids followed by a contract award is made to the contractor whose bid is most advantageous to the Government, considering price and price-related factors. The Government may only award a Firm-Fixed Price (FFP) or a FFP with economic price adjustment contract in response to sealed bid offer. Sealed bidding is one method to achieve full and open competition mandated by the Competition in Contracting Act of 1984.

b. Competitive Proposals

Competitive proposals is a method of contacting that utilizes the Request for Proposal (RFP) to set out the Government's needs and the criteria for evaluation of offers utilizing the uniform contract format. In the case of complicated proposals, draft RFPs are often used to receive

industry input and clarify sophisticated issues. The evaluation criteria used in the RFP is to inform offerors of the relative weight of the evaluation factors, including price and non-price related items. [Ref. 18:p. 15.605]

The RFPs are then advertised in the same manner as the IFBs. After the proposals have been received, the contacting officer reviews each proposal and identifies apparent problems and may conduct discussions with offerors deemed to be within the competitive range. The competitive range includes all offerors that have a reasonable chance of being selected for award. [Ref. 19:p. 15.609] Unless there is an award on initial proposals, the contracting officer must conduct oral or written discussions with all offerors in the competitive range. Upon completion of discussions, "Best and Final Offers" are obtained from the offerors remaining in the competitive range. Upon receipt of Best and Final Offers proposal teams again evaluate proposals using either the formal or informal method of source selection.

(1) Formal Selection. Formal competitive RFPs require that a specific evaluation group be established to evaluate proposals and select an offeror for contract award. The formal evaluation and selection of RFPs is normally used in high-dollar value acquisitions or as directed by the Senior Acquisition Executive for the particular agency. The formal selection organization, depending upon the type or

requirement, is made up of a source selection evaluation board, source selection advisory council, and the source selection authority, (SSA). The SSA must consider rankings, ratings, and recommendations prepared by the evaluation and advisory groups. Upon review of all pertinent factors, the SSA must then evaluate the factors established in the solicitation to make the contractor selection.

(2) Informal Selection. The informal method of selecting and evaluating offerors for a Government contract is the most common method utilized within the contracting arena. The informal selection method is normally used for routine, recurring requirements with dollar values less than major weapons systems acquisition. The contracting officer may perform as the SSA and conduct all of the solicitation requirements, price analysis, technical evaluation, and negotiation of the contract throughout the entire pre-award process.

c. EDI and Sealed Bidding/Competitive Negotiation

The majority of DoD's budget is expended by using Government contracts. The amount of dollars obligated using contracting methods in FY'88 accounted for 91% of DoD's contract obligations. [Ref. 2:p. 2-4] Although the amount of documents used repetitively is less than in the simplified purchase arena, the volume of paperwork is much greater.

With each F-18 jet fuselage that Northrup turns out, it creates 16,295 pages of manufacturing paperwork. Since the F-18 program began, it has generated enough paper to equal the height of the Empire State Building [Ref. 20:p. 145].

In today's austere budget environment, DoD is relying more extensively on commercial off-the-shelf items rather than procuring items designed to military specifications. Additionally, all major weapon systems contracts now require contractors to utilize CALS in providing all technical information in a digital format. The Aviation Supply Office, (ASO), and the Navy CALS office have generated a transaction set, using an X12 format, to accept provisioning and design changes via EDI. The Naval Air Systems Command has developed a transaction set, designated 196, to allow for EDI transmission of contractor cost data reporting information. All of this technical information along with cost and pricing data would be invaluable in the pre-award phase when evaluating contractor proposals and current business information is critical. [Ref. 13:p. 3-4]

Sealed bidding and competitive negotiation solicitation packages may sometimes run into the thousands of pages. ASO and the Naval Sea Systems Command will be using transaction set 805, contract pricing proposal, to allow solicitations with technical data to be electronically transmitted to an electronic bulletin board system similar to EASE.

ASO has established trading partner agreements with 30 of the contractors with which they exchange the most paper. They eventually plan to exchange EDI with the top 50 contractors, which account for 75 percent of their business. [Ref. 13:p. 3-2]

This solicitation package system will be compatible with many technical specifications in an EDI format and provide potential offerors with immediate access to not only the solicitation, but also the associated technical data. Additionally, solicitations will be able to be transmitted to the CBD for immediate publication and dissemination to the marketplace. [Ref. 13:p. 3-4]

All of these efforts to utilize EDI in the sealed bidding and competitive negotiation pre-award acquisition process are providing small businesses access to information and markets in which they have previously been unable to participate. EDI technology in the pre-award process will permit entire solicitations to be posted on electronic billboards and thereby allow any small business supplier to compete for Government contracts anywhere in the United States.

We believe that expanded use of information technologies will not inhibit small business participation. On the contrary, EDI and electronic bulletin boards will disseminate small purchase solicitation information so efficiently and fairly that small business participation will be stimulated. The Government's payoff will be increased competition, which will result in lower prices and better goods and services. [Ref. 2:p. 2-5]

As such, utilizing electronic bulletin boards and electronic brokers to reduce the cost of obtaining potential Government contracts can "level the playing field" between large and small businesses creating a more competitive environment within industry.

The next chapter will identify and discuss the various barriers and impediments to implementing EDI with small business concerns including: strategic and organizational change, electronic signatures, security, and statutory requirements.

IV. BARRIERS TO IMPLEMENTATION

A. INTRODUCTION

EDI and CALS provide a technology that will allow both private and public sector businesses to move from a paper based world to one based solely on electronic transmissions. Several factors have contributed to the expanding popularity of EDI in the acquisition and contract management arenas. These factors include cost savings associated with the transfer of technical data and contract awards. However, while the use of EDI has gained in popularity, a number of issues must be resolved for EDI to be successfully implemented. The most effective use of EDI requires changes in the way business transactions are traditionally conducted between organizations. A reduction in the paper evidence and audit trails of transactions both sent and received has raised serious legal and statutory concerns. As the use of EDI increases, these issues are highlighted not only between trading partners, but also within and between public and private organizations as a whole. The major legal issues center around regulatory and statutory legislation and electronic security.

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B. STRATEGIC AND ORGANIZATIONAL CHANGE

In today's austere environment of declining defense budgets, increased international competition, and continual political change, government and business must think and act both strategically and organizationally as never before. As such, the most significant barrier affecting the implementation of EDI in the pre-award acquisition process is the failure to recognize and resolve the strategic and organizational aspects of change. This section will focus on EDI technology as a catalyst to influence strategic and organizational change within both DoD and small businesses alike, (i.e., the private sector).

1. Strategic Issues

The Department of the Navy (DoN) has established a strategic vision that establishes EDI as the central component of its EC vision as follows:

> Electronic commerce is the paperless exchange of business information within the DoD and between DoD and industry. To promote this vision, DoD and industry are establishing telecommunication links and building information system infrastructures. These efforts require information technologies, such as EDI, and changes in business processes. When available, EC will allow DoD Components to accomplish their missions within a budget-constrained operating environment. [Ref. 13:p. 2-2]

Both the DoD's and the DoN's strategic visions of implementing EDI will not only change the way we do business with private industry, but require basic organizational changes within all DoD and DoN procurement components to maximize the return on

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technology investments. As previously discussed, EDI was initially developed by large corporations as a strategic business issue to improve the method of transferring large amounts of information and reduce manual errors. As such, acceptance of EDI as "the way to conduct business" between industries has been largely restricted to the large corporations. However, industry's lack of strategic planning between and within the marketplace is extremely difficult to implement;

> When strategic planning is focused on a function that crosses organizational or government boundaries...almost all the key decision makers will be outsiders. In these situations, the focus of attention will be on how to organize collective thought and action within an organizational network where no one person or individual is in charge, but in which many are involved. We should expect that it might be more difficult to organize an effective strategic planning process in such a "shared power" context. [Ref. 21:p. 3]

As such, the failure of industry and in particular small businesses to reach a consensus, recognize EDI as a competitive strategy, and use it to their advantage is a major impediment restricting DoD's and DoN's implementation efforts. In addition to the strategic issues restricting EDI implementation, resistance to organizational change poses even a greater threat.

2. Organizational Issues

Resistance to change within any government or business organization is a reality. Since organizations are made up of people, their willingness to accept or resist EDI is based

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upon how it will effect their lives. This resistance to change (i.e., EDI) is based upon the extent to which their established daily pattern of activities is altered. Understanding how strongly an organization feels about the changes resulting from EDI is an important first step in managing the dynamics of resistance. Recognizing this inherent resistance to organizational change, management can ease the transition to an electronically based business environment by building commitment for EDI. [Ref. 22:p. 21]

Successful management methods that have resulted in building commitment and implementing EDI within an organization include: strong top management leadership, early user involvement, and organization-wide training. [Ref. 23:p. 156]

Strong management leadership and sponsorship of EDI is crucial to managing change within an organization. Without the management and leadership support from small businesses EDI implementation is not possible. As such, an aggressive education and training process stressing the benefits of EDI and how it can be integrated with existing systems is equally important. [Ref. 23:p. 157] These types of actions should be focused on small businesses to help instill a feeling of ownership and responsibility. Another barrier in the adoption of EDI, as the normal way to conduct business, involves the FAR requirement that all contractual documents be physically signed by the accountable individuals.

C. REGULATORY AND STATUTORY IMPEDIMENTS

Congress focuses a considerable amount of attention upon the DoD acquisition process. Since 1984, hundreds of procurement laws have been passed to reform and control Federal acquisition. Several laws affecting implementation of EDI need to be amended or revised in order to accommodate electronic commerce. The laws and regulations most restrictive in allowing EDI in the pre-award acquisition process are the FAR and the Walsh-Healy Public Contacts Act.

1. The Federal Acquisition Regulation

The primary impediment in utilizing EDI is the FAR requirement stipulating that contracting officers, of Government agencies, "sign" contracts or that the procurement officials identification be stamped, typed, or printed on the contract. [Ref. 24:p. 4.1] The requirement for signature authentication stems from 31 U.S.C. 1501, which establishes the criteria for recording financial obligations against the Government. This statutory requirement mandates that a binding agreement between parties must be supported by documentary evidence in a written form that is authorized by law.

U.S. courts and administrative agencies have held that a signature consists of writing one's name with the intention to authenticate a transaction. Additionally, any symbol adopted as a signature and affixed to a contractual document

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with previous knowledge and consent is considered a binding legal signature. Blacks' Law Dictionary provides an authoritative definition for signature as follows:

A signature may be written by hand, printed, stamped, typewritten, engraved, photographed, or cut from one instrument and attached to another, and a signature lithographed on an instrument by a party is sufficient for the purposes of signing it; it being immaterial with what kind of instrument a signature is made...And whatever mark, symbol, or device one may choose to employ as representative of himself is sufficient...

GAO has further recognized that machine-made signatures and facsimile signatures are legally binding. The FAR has already been modified to accept unsigned Government contracts as legally binding for small purchases, [Ref. 25:p. 13.5]; similarly, purchase orders transmitted by telecommunications (i.e., TELEX) are considered legal documents. [Ref. 26:p. 13.6] Courts have held that once a person uses a unique code signature with the intent to establish a legally binding transaction, that transaction is enforceable by law. In order for a unique electronic code signature (legally binding documents used with EDI) to have enforceable status it must be afforded a measure of security to preclude unauthorized individuals from gaining access to that signature code.

The security of electronic code signatures involving EDI starts with physical security and ends with cryptographic software enhancements. The traditional method of authenticating identity is done by typing in a unique

password. This method is subject to compromise from passive wiretapping, "hacking", or unauthorized access to the actual code itself.

Fortunately, commercially available software provides many of the controls necessary to provide legality to electronic code signatures. Utilization of public key encryption (PKE) for digitized signatures provides maximum protection for a symbol or signature. PKE is based upon algorithms that separate the capacities for encryption and decryption, allowing a user to "sign" a purely digital message that provides exact authentication. PKE is being incorporated into today's EDI translation software programs and provides legitimacy to electronic records. GAO recently ruled that contractual documents utilizing EDI meet the statutory requirements of 31 U.S.C. 1501 as follows:

> Although the terms of the contracts formed using EDI are stored in a different manner than those of paper and ink contracts, they ultimately take the form for visual symbols. We believe that it is sensible to interpret federal law in a manner to accommodate technological advancements unless the law by its own terms expressly such an interpretation, or sound policy reasons exist to do otherwise. It is evident that EDI technology had not been conceived nor probably was even anticipated at the time section 1501 and the statutory definition of "writing" were enacted. Nevertheless, we believe that given the legislative history of section 1501 and the expansive definition of writing, section 1501 and 1 U.S.S. 1 encompass EDI technology [emphasis added]. [Ref. 28:p. 3]

Security of electronic signatures is now widely acknowledged by GAO and the Federal court system as legally enforceable within today's EDI environment. Additionally, EDI

allows for many cumbersome representations, and certifications, as well as the associated labor-intensive administration, to be eliminated, (i.e., timeliness, mail delays, and errors).

In addition to the requirement for signature authentication many other FAR provisions need to be modified to allow EDI implementation to take place in the pre-award acquisition process. Many of the FAR regulations that need to be updated have been identified in a recent report published by the Logistics Management Institute (LMI), "Electronic Commerce: Removing Regulatory Impediments." [Ref. 27:p. A-1] Table II displays some of the FAR changes needed to replace paper with electronically exchanged information in the pre-award acquisition process. A detailed description of the specific language required to be modified within the FAR regulations can be found in LMI's report.

2. The Walsh-Healy Public Contract Act

The Walsh-Healy Public Contracts Act, (WHPCA), 41 U.S.C. 35-45, requires that any business selling to the Government for contracts greater than $10,000 be a regular dealer or manufacturer in the manufacture or furnishing of materials, supplies, articles, or equipment used in performance of the contract [Ref. 29:p. 22.6.2]. A regular dealer is one that regularly maintains a stock of the item to be purchased on a "continuing and not on a demand basis"

Table II.   REPLACING PAPER WITH ELECTRONICALLY EXCHANGED INFORMATION

Type of Function	Electronic Method	Required Change	Regulation
Define buying requirements	EDI ANSI transaction set 511, and 841	Recognize paperless documents	FAR Parts 13, 15 and internal regulations and procedures
Solicit bid or quotation	EDI ANSI transaction set 840	Authorize EDI RFQs, IFBs, RFPs and amendments	FAR Parts 4, 13, 14, and 52
Provide Bid, quotation, and cost/pricing data as applicable	EDI ANSI transaction sets 842 and 805	Authorize EDI bids, quotations and cost proposals	FAR Parts 4, 13, 14, and 52
Award Contract including price, quantity, and delivery information	EDI ANSI transaction set 850	Authorize EDI contract awards, purchase orders, and delivery orders and modifications	FAR Parts 4, 13, 14, 16, and 52
Source: Developed by researcher.			

[Ref. 30:p. 22.6.3]. Manufacturers or dealers are permitted to bid, negotiate, and contract through an authorized agent if that agent acts and contracts in their name [Ref. 31:p. 22.6.4]. The act's statutory history and interpretation under law was intended to eliminate contract awards through "bid brokers" that would "restrict bounty for government contracts" and provide protection to the manufacturing employees on such matters as minimum wages, maximum hours, child labor, convict labor, and safe and sanitary conditions.   [Ref. 6:p. 73]

Based upon the requirements of the WHPCA the contracting officer must make a determination on whether a responsive offeror, that will receive a contract award, is in

fact eligible to receive the award. In an EDI environment the offerors must provide this certification of eligibility in response to the RFQ, IFB, or RFP. The WHPCA requirement for certification has been resolved by the EASE bulletin board which requires prospective offerors to register their businesses with the procuring organization prior to their submission of quotations. As such, responses to Government requirements through electronic bulletin boards using EDI can be designed to sufficiently address the provisions of the WHPCA.

Another complication to utilizing EDI and meeting the intent of the WHPCA is the requirement that the dealer maintain a regular stock of the item on a "continuing and not on a demand basis." [Ref. 30:p. 22.6.3] One of the major advantages to utilizing EDI is the ability to reduce on-hand inventory quantities to the minimal amount necessary through use of just-in-time (JIT) inventory management. Reduction of on-hand inventory quantities fosters better management of capital resources and allows businesses to become more efficient. Under the current provisions of the WHPCA many businesses utilizing JIT management techniques could be disqualified from the competition since they would no longer be defined as a "regular dealer." As such, the WHPCA would require revision in order to allow businesses to compete in an EDI environment. However, proper identification of these impediments by DLA to the appropriate technical and

legislative concerns should be sufficient in order to revise the WHPCA for further EDI implementation.   [Ref. 6:p. 74]

The organizational, legal, and regulatory impediments blocking implementation of EDI on a widespread basis are slowly being overcome and resolved. In an electronic business environment, mandatory requirements for written signatures as well as the storage of paper documents is no longer practical. The acceptance of electronic records as evidenced in Federal judicial proceedings and GAO decisions is now widespread. As Government and private industry increasingly rely on electronic records, EDI will become the preferred method of conducting business.

The next chapter will discuss the findings based upon a survey of 375 small business suppliers. The survey was used to understand and analyze the current state of EDI technology with small business suppliers and what barriers and impediments they are facing in implementing EDI.

V. SURVEY FINDINGS

A. INTRODUCTION

DoD's enacting of EDI initiatives throughout each military Service, implementation of DMRD 941, and increasing pressures to streamline and economize business operations have all fostered a growing interest in EDI both within DoD and private industry. This chapter will provide a summary of the responses to questions in the survey, (see Appendix). When the survey data collection was concluded, 108 surveys had been returned and all were sufficiently complete to be included in these findings. A series of graphs and tables are used in this chapter to present the results of the survey. All graphs and tables in this chapter were developed by the researcher. The purposes of this survey are as follows:

- Determine the current level of EDI usage within small businesses;

- What is the growth rate of EDI and related messaging;

- What business documents have been planned to be converted to EDI usage;

- What are the perceived benefits and barriers to EDI implementation;

- What factors have contributed to the planned usage of EDI;

- Determine the use of Third-Party Networks in EDI implementation; and

- What are some of the lessons learned from major corporations implementing EDI with small businesses.

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B. SURVEY METHODOLOGY

To accomplish the purpose of this thesis, a survey was developed to question 375 small business suppliers as to what was current state of their EDI usage. Survey questions were not limited to the pre-award acquisition process, but designed to cover overall business processes. The author contacted the Small Business Specialists from the Naval Regional Contracting Center, Washington, D.C., Naval Supply Center, Puget Sound and the SBA to obtain a list of potential survey participants. Survey participants were selected from across the spectrum of Standard Industry Classification codes; representative of the private sector of the U.S. economy. Respondents were assured that all information provided would be used in summary totals only and that any reference to a particular respondent's response would be made only by permission. For survey respondents currently using or planning to use EDI in the near future, more detailed implementation questions were asked on actual EDI operations. For survey respondents who are not utilizing EDI, questions were oriented more towards cost and implementation constraints. The following section provides a general description of the survey population. The information is self-reported and, as a result, may contain errors that are not identifiable.

C. RESPONDENT CHARACTERISTICS

Respondents represented virtually every state, while California and Washington had the largest number of respondents.

1. Size of Respondent

The size of the respondent was measured by two indicators: 1) annual sales dollars in the respondent's most recently completed fiscal year, and 2) annual sales dollars attributable to Government contracts actions in that year. Respondents were also asked if they were entered in the SBA's Procurement Automated Source System (PASS) and if the had a Commercial and Government Entity Code (CAGE). The results of the survey indicated that eighty-one respondents (i.e., seventy-six percent) indicated that they were entered into the PASS or CAGE systems.

a. Annual Sales Revenue

The breakdown of respondent size based on annual sales dollars is displayed in Table III. The average annual sales dollars is $4.1 million with a median of $5 million. Four of the respondents did not answer this question and cited that sales levels are considered confidential information and not subject to release. Excluding the respondents who did not answer or refused to answer, the results were normalized.

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Table III.   RESPONDENT FIRM SIZE

Question: What was your company's total revenue for your fiscal year 1992?		
Size Category	# of Respondents	% of Respondents
Below $200,000	17	16.40
$200,000-$500,000	17	16.40
$500,000-$999,999	10	9.60
1 - 10 Million	53	50.90
11 - 25 Million	3	2.90
26 - 50 Million	4	3.80
Totals	104	100.00

b. Total Revenue from U.S. Government

The total amount of annual sales revenue obtained as a direct result of Government contracts provides an indication of the respondents overall customer base. Figure 2 provides a graphical display of the survey results. As will be analyzed in the following chapter, the Government.' role in fostering an EDI environment is highly related to its relative position as a customer.

c. Title of Respondent

Respondents were asked to provide their title and function within their business organization. The respondents were generally composed of upper level management positions,
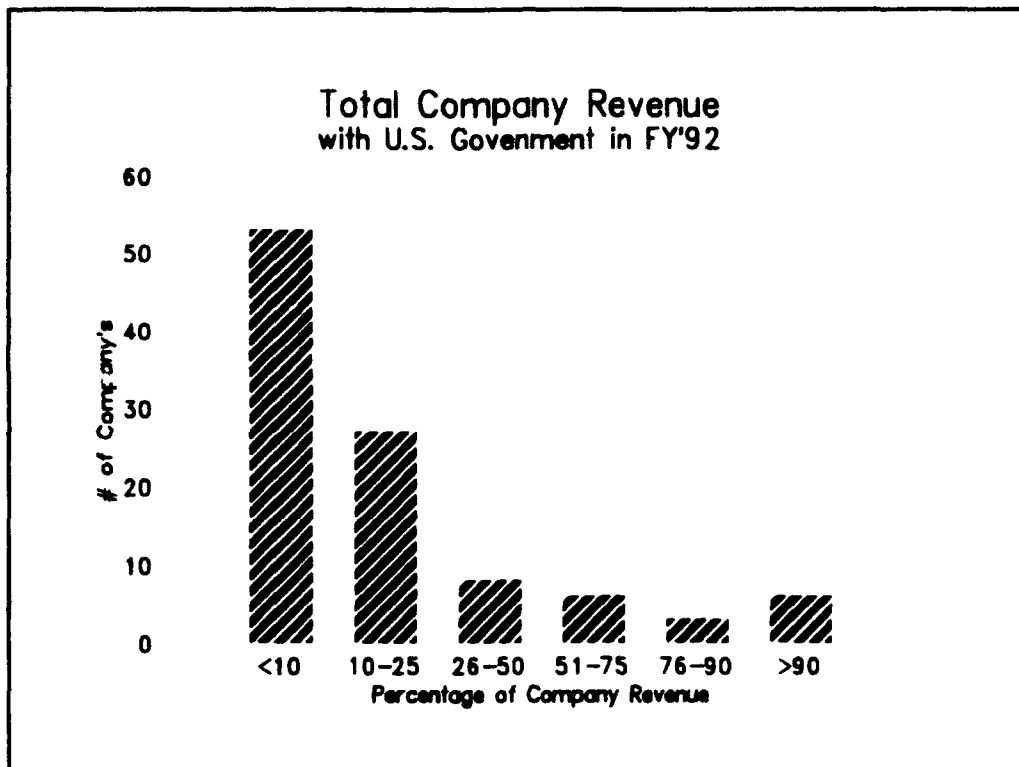
Figure 2. Percentage of Business from Government

which was expected due to the nature of the businesses surveyed. Table IV displays the results of the survey.

D. SMALL BUSINESS EDI ACTIVITY

The overall interest in EDI activity for small business suppliers continues to grow as electronic commerce becomes an acceptable method of conducting business. However, until EDI usage becomes widespread in the marketplace, many small business firms will continue to use paper based methods to conduct their business transactions. This section will present the results of the survey that indicate the general state of EDI activity for small businesses.

Table IV. TITLE OF RESPONDENT

Question: What is your title within the business organization?		
Title	# of Respondents	% of Respondents
Owner/President	43	47.25
Vice-President	10	10.98
Middle Manager	31	34.07
Corporate Secretary	3	3.30
Comptroller	4	4.40
Totals	91	100.00

1. Overall EDI Activity

Of the 108 respondents, 16 are currently engaged in EDI operations with other trading partners. An additional 15 respondents plan to implement EDI within the next two years and a further 14 respondents plan EDI usage in the near future. Sixty-three of the respondents never thought about using EDI and have no plans for implementation. Figure 3 summarizes these results.

In 1989, a Gallup Poll Organization conducted a telephone survey on the usage of EDI with major corporations in the private sector. The overall results of that Gallop survey indicated that 17% of all companies polled were using some form of EDI to conduct business transactions. Another
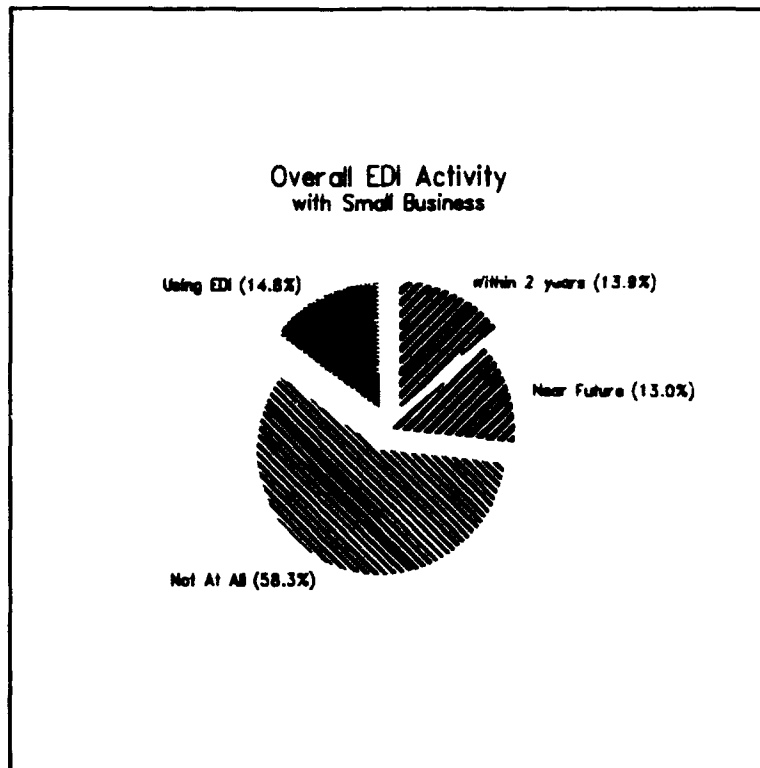
Figure 3. Overall EDI Activity

5.4% of firms planned to implement EDI by the end of 1989, and 5.7% planned to implement EDI by the end of 1990. [Ref. 32:p. 15-16] Small Businesses using EDI were asked if they expected EDI usage within their business or particular industry to change within the next year. Eighty-seven percent of the respondents indicated that EDI usage will increase and the remaining 13% indicated no significant change was foreseeable.

Additionally, those respondents using or planning to use EDI indicated that they would utilize the ANSI X12 standards. Respondents using EDI indicated that they sent an average of 100 EDI transactions and received an average of 45 transactions per month. The range of EDI transactions

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transmitted indicated a range from 2 to 500, similarly, the range of transactions received by respondents was from 15 to 150. Due to the growing acceptance of EC/EDI in the marketplace, small businesses have accepted the ANSI X12 standards and transaction sets as the mechanism to conduct EC.

2. Anticipated Growth in EDI Partners

One measure of the strength of the EDI marketplace is the expected growth in the number of future EDI trading partners. Respondents who were using EDI were asked to indicate if the number of their trading partners was going to increase, remain the same, or decrease. At the time of the survey the average number of trading partners was 11.4 per small business with a median of 3.00. A large percentage of the respondents had ten or less trading partners indicating that the median number of trading partners is more representative of the typical small business. Table V summarizes the results of the survey.

3. Conversion of Business Documents to EDI Documents

Another source of EDI growth and acceptance within the small business community is the conversion of non-EDI documents to an EDI standard format. The survey asked respondents for their priority in converting business documents from paper to EDI. Respondents were asked to rate their conversion priority on a scale from one to four. A rating of one indicates that the document has "top priority

Table V. CHANGES IN EDI USAGE

Question: Will EDI usage in your business and particular industry change in the next year?		
Category	# of Respondents	% of Respondents
Increase	13	81.25
Not Change	2	12.50
Decrease	0	0.00
Unknown	1	6.25
Totals	16	100.00

and is planned immediately"; a two indicates that the EDI conversion is "planned within two years"; a three is for "low priority documents but planned for in the future"; and four is for documents "not planned for EDI conversion." Respondents currently using EDI and planning to use EDI rated their conversion priorities and several differences were apparent. Ratings were computed as a weighted average. Table VI summarizes the results of the survey.

Comparisons between current EDI users and those planning to use EDI was performed by evaluating the survey data to determine statistical independence. Statistical independence is defined as follows:

Event B is said to be statistically independent of event A, if the occurrence of event A does not affect the probability that event B occurs. [Ref. 33:p. 194]

Utilizing the survey data, statistical independence can be determined through use of the chi-square independence test.

Table VI. CONVERSION FROM PAPER TO EDI

Document Category	Current EDI Users		Planning to Use EDI	
	Rating	Rank	Rating	Rank
Invoice	2.46	2	2.50	3
Payment/Remit	3.08	3	2.60	4
Sales Catalog	3.17	4	3.04	6
Contract Award	2.08	1	2.31	1
Shipment Info.	3.40	5	2.46	2
Spec/Tech Info.	3.63	6	2.63	5

Question: Do you have a priority for converting the following business documents from paper to EDI?

Rating Scale: 1 = top priority, planned immediately; 2 = planned within 2 years; 3 = low priority, planned but not in near future; and 4 = not planned.

Roughly, the chi-square independence test means that knowledge of the respondent's type of EDI usage (i.e., EDI users and those planning to use EDI) for one of the document categories imparts no information about the other respondent's document category. More precisely, statistical independence for the two types of respondent's is defined as follows:

Two characteristics (i.e., type of respondent) of a population are called statistically independent (or non associated) if within the categories of one of the characteristics, the distributions of the other characteristic are the same. [Ref. 33:p. 554]

The chi-square independence tests were performed at the 5% significance level with 5 degrees of freedom to determine if the category characteristics between EDI users and those planning to use EDI are statistically dependent. The results

of the chi-square independence test produced a test statistic of 2.113 which indicates that the priority for converting business documents from EDI to paper were statistically independent. As such, analysis of EDI users and those planning to use EDI could be objectively evaluated by comparing the relative ranking of each document category.

Both groups of respondents rated their top business transaction for EDI conversion to be the contract award document. This was expected since many of the direct and indirect cost savings associated with the usage of EDI have been documented in the pre-award acquisition process. Close behind contract award was invoicing followed by payment order/remittance, (i.e., electronic funds transfer), as the next most important documents to be converted to EDI.

However, one major difference is apparent, for those planning to use EDI, shipping information was rated second behind contracting as the document most likely to be converted to EDI. Conversely, EDI users rated conversion of shipment information fifth, much lower than those planning to use EDI.

4. Conversion of Facsimile or Telex to EDI

In the survey a question was asked to determine the current levels of TELEX or FAX usage and if this form of communication was a first step in establishing electronic communication with their trading partners. As a result, 87.36% of the respondents claim to use TELEX or FAX to

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exchange business information, 10.34% were somewhat likely, and 2.30% were not interested at all. The results of the survey are summarized in Table VII.

Table VII. USE OF FAX AND TELEX AS FIRST STEP TO EDI USAGE

Question: Are you very likely, somewhat likely, or not at all likely to use TELEX or FAX as the first step in electronic communication with your trading partners?		
Category	# of Respondents	% of Respondents
Very Likely	**76**	**87.36**
Somewhat Likely	9	10.34
Not at all Likely	2	2.30
Totals	87	100.00

5. Evidence of Commitment to EDI

The survey provided strong evidence that small businesses in the U.S. are committed to EDI and that EDI will increasingly become part of their overall business strategy. The researchers findings are based upon observations of several key factors in the survey:

- Respondent firms indicated significant growth in the number of EDI trading partners;

- Respondents expect to convert many non-EDI documents to standard EDI formats; and

- Respondents indicted that a significant portion of their TELEX and FAX transmissions will be converted to EDI.

E. THE BENEFITS AND BARRIERS TO EDI

In order to understand how implementation of EDI with small businesses can be successfully planned and coordinated, the survey questioned respondents on the significant benefits as well as barriers to EDI implementation. By knowing the benefits and barriers to EDI implementation, the DoD can draft policy that will help remove barriers and enhance EDI growth. The results of the survey will provide direction on developing policy to implement EDI within small businesses.

1. The Benefits of Implementing EDI

The survey requested respondents, who are using or planning to use EDI, to provide the main factors that contributed to their usage of EDI. Respondents were asked to rate the contributing factors to EDI implementation on a five-point scale. A rating of five indicates that the contributing factor is "very important," and a rating of one indicates that the factor is "not important at all or not applicable." The survey data will be used to compare those currently using EDI to those planning to use EDI. Table VIII presents the results of the survey.

Once again a chi-square independence test was conducted to determine statistical independence. The results of the chi-square independence test produced a test statistic of 3.792 with 5 degrees of freedom which indicates that the factors contributing to the planned adoption/use of EDI were

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Table VIII. CONTRIBUTING FACTORS TOWARDS EDI USAGE

Question: How did the following factors contribute to the planned adoption/use of EDI?				
Factor Category	Current EDI Users		Planning to Use EDI	
	Rating	Rank	Rating	Rank
Customers Request	3.93	**1**	3.86	**1**
Reduce Document Handling Costs	3.38	2	3.19	3
Reduce delivery and production lead times	2.92	3	2.65	5
Broaden Supplier Base	2.00	6	2.21	6
Broaden Customer Base	2.25	**5**	3.71	**2**
Better Accuracy	2.46	4	3.13	4
Rating Scale: 5 = Very Important; and 1 = Not at all Important or not applicable.				

statistically independent between EDI users and those planning to use EDI. As such, an analysis of the EDI users and those planning to use EDI can be performed by comparing the relative ranking of each factor category.

Customer request was the number one contributing factor toward adoption of EDI cited by those planning to use and those currently using EDI. This was expected since many large businesses have been mandating EDI compatibility with their suppliers (i.e., small businesses) as a condition to doing business. Respondents using EDI were further asked if

they were required to use EDI as condition in doing business with their trading partner. Fifty-seven percent of the respondents indicated that adoption of EDI was conditional to continuing business. Additionally, respondents using EDI were asked if they required their suppliers to implement EDI; only 14% indicated in the affirmative.

Respondents planning to use EDI rated a broadening customer base as number two, while EDI users rated reduced document handling costs as number two. It is interesting to note that some features of EDI were not perceived as benefits by respondents planning to use EDI as compared to those that have already implemented EDI. For example, after customer request, EDI users rated reduced document handling costs, reduced production/delivery lead times and better accuracy as important factors in using EDI. All of these factors are internal business processes that produce a more efficient and economical business operation. Conversely, following customer request, those planning to use EDI rated a broadening supplier base, reduced document handling costs and better accuracy as important factors in contributing toward EDI usage. Therefore it seems that once EDI is adopted, justification and usage of EDI is seen as a business necessity rather than a customer request.

2. The Barriers to Implementing EDI

Implementation of an EDI policy that addresses the barriers and impediments to EDI usage is crucial to the acceptance of EDI by small businesses. The survey requested respondents on what constraints were delaying the adoption of EDI. The respondents rated constraints, that were delaying adoption of EDI as follows: 1) a rating of one indicates "very critical;" 2) a two indicates "somewhat critical;" and 3) a three indicates "not at all critical." The results of survey are presented in Table IX.

Comparison of the survey results was first subjected to the chi-squared independence test. The results of the chi-square independence test produced a test statistic of .2627 with 5 degrees of freedom which indicates that the constraints as experienced by EDI users and those as perceived by both planning and not planning to use EDI were statistically independent. As such, a comparison of the relative rankings of each constraint was evaluated to provide some insight.

The top constraint for those using EDI was a lack of understanding regarding the benefits and capabilities of EDI. This may be indicative of the innovative nature of current EDI technology. The top constraint for those both planning and not planning to use EDI was the cost of EDI hardware/software and training. Another barrier in the survey identified by EDI users was that a lack of trading partners

Table IX. CONSTRAINTS DELAYING ADOPTION OF EDI

Question: How important do you feel are the following constraints in delaying the adoption of EDI?				
Constraint Category	Current EDI Users		Planning to Use EDI	
	Rating	Rank	Rating	Rank
Lack of Understanding	1.58	1	1.54	2
Lack of Personnel	2.17	5	1.90	3
Cost for EDI hardware, software and training	1.69	2	1.51	1
Loss of Paper Audit Trail	2.08	4	2.14	5
Data Integrity and Security	1.92	3	2.00	4
Legal Issues	2.42	6	2.23	6
Rating Scale: 1 = Very Critical; 2 = Somewhat Critical; and 3 = Not at all Critical.				

willing to conduct EDI transactions was "very critical" in delaying EDI adoption.

Respondents both planning and not planning to use EDI were further questioned on how much they felt was a justifiable initial investment and monthly communication charge for EDI implementation. The results of the survey are provided in Table X. Nearly all small businesses indicated that the amount of initial investment and monthly maintenance cost should be as low as possible.

The concern about the move to electronic transactions is the impact such a move will have on small businesses. Opponents of EDI claim that small businesses can't afford the set-up cost necessary to carry on electronic transactions. To overcome this problem, most big businesses that require EDI are also providing information and training to small businesses that want to be EDI compliant. And, with the rapidly decreasing prices of microcomputer hardware and EDI software, the cost to a small business really isn't excessive... [Ref. 34:p. 2]

Even though small businesses rated cost as their number one constraint delaying EDI adoption, the actual cost of EDI implementation, as provided by EDI users is generally less than $1,000.00. Additionally, all respondents (i.e., 100%) indicated that some form of computerized support have been used within their business operation.

Respondents who were using EDI were asked to provide initial estimates on the total cost of their EDI implementation and how actual cost compared with their initially estimated costs. Table XI provides the survey results.

Based upon the results of the survey summarized in Table XI, the initially estimated cost to implement EDI within a small business was less than $3,500 for 77% of the respondents. Additionally, the actual cost of EDI implementation was the same as the estimated costs in 85% of the respondents. As presented in Table X, the actual cost of EDI implementation compares favorably to what most small businesses would be able to justify as an initial investment, (i.e., 78% can justify $5,000). As such, the survey data

Table X. JUSTIFIABLE INITIAL INVESTMENT AND MONTHLY COST

Question: How much is a justifiable investment for EDI software/hardware and training?		
Category	# of Respondents	% of Respondents
Under $5,000	62	77.50
$5,000 - $10,000	17	21.30
$10,000 - $20,000	1	1.20
Over $20,000	0	0.00
Totals	80	100.00
Question: How much is a justifiable monthly cost for EDI operational maintenance (including telecommunication charges)		
Category	# of Respondents	% of Respondents
Under $500	75	93.75
$500 - $1,000	4	5.00
$1,000 - $5,000	0	0.00
$5,000 - $10,000	1	1.25
over $10,000	0	0.00
Totals	80	100.00

indicates that cost is not a significant barrier for small businesses to implement EDI, as contrary to the general perception on the part of respondents planning to use EDI.

F. EDI IMPLEMENTATION AND THIRD-PARTY NETWORKS

The previous sections of this chapter have presented EDI implementation with small businesses as gaining acceptance and identified several of the benefits and barriers. This section

Table XI. JUSTIFIABLE INITIAL INVESTMENT AND MONTHLY COST

Question: What was the total cost of EDI implementation within your company, (i.e., estimated cost of hardware, training, software, training, etc.)?

Category	# of Respondents	% of Respondents
Under $1,000	6	46.16
$1,000 - $3,500	4	30.77
$3,500 - $7,000	1	7.69
Over $7,000	2	15.38
Totals	13	100.00

Question: How did your actual implementation cost compare with your initial estimate?

Category	# of Respondents	% of Respondents
Higher than initial estimate	1	7.69
Approximately the same	11	84.62
Lower than initial estimate	1	7.69
Totals	13	100.00

will discuss the role of the third-party value-added network

(VAN) in EDI operations with small businesses.

A third party value-added communication network (VAN) transmits data between different locations and different types of computers, stores messages until retrieved, translates a message from one data format to another and provides other related network services. [Ref. 32:p. 22]

The services provided by VAN's assist small businesses in

overcoming   some   of   the   technical   barriers   to   EDI

implementation.

1. Percentage of EDI Users Employing VANs

Respondents using EDI were asked if they utilized a VAN in conducting their EDI business transactions. Of the 14 respondents, 79% indicated that they currently utilize VANs in their daily EDI operations. Of the three respondents that indicated that they did not utilize VANs, two were not aware of the support services provided by a VAN, (i.e., electronic mailbox, translation, encryption, security, etc.). Those currently using a VAN for EDI messaging indicated that the electronic mailbox service was used by 73% of the respondents. The average monthly VAN communication charge was $108.00 and most small businesses paid for their VAN usage depending upon their amount of on-line time. As identified earlier in Table X, 94% of the small businesses surveyed indicated that they would not be willing to spend more than $500.00 for EDI telecommunication charges and operational maintenance. Therefore, the monthly cost of EDI telecommunication and maintenance is not prohibitive to the majority of small business.

2. The Use of Translation Software for EDI

Respondents using EDI indicated they purchased translation software rather than develop their own software sixty-five percent of the time. Of the 16 respondents using EDI, relatively few were integrating their EDI software (i.e., either purchased or developed in-house) into the functional

areas of their business operation. The results of the survey are provided in Table XII and indicate that relatively few small businesses actually integrate EDI into business operations without manual intervention.

Table XII. INTEGRATED EDI CAPABILITY

Question: Which of the functional areas have an integrated EDI capability?	
Category	# of Respondents
Purchasing	5
Inventory Control	3
Manufacturing	1
Bidding/Order Entry	6
Distribution/Transportation	2
Accounting	5

G. EDI TRADING PARTNER AGREEMENTS

EDI Trading Partner Agreements (TPAs) provide a legal basis for all EDI transactions. TPAs are bilateral documents that define the specific terms, EDI transaction sets, dispute procedures, and methods in conducting electronic commerce. [Ref. 35:p. 1-4] Thus, TPAs play a very important role in fostering an EDI environment while providing protection to both trading partners.

The purpose of the TPA is to ensure that all EDI-created obligations are legally binding on all trading partners. This

allows each trading partner to tailor the terms and conditions of his/her participation in the agreement.

Respondents using EDI were asked if they currently utilize TPAs with their trading partners. Survey results indicated that 71% of the respondents utilized TPAs and that 50% of those TPAs were tailored to each individual partner.

H. GENERAL SURVEY CONCLUSIONS

EDI is gaining acceptance in the small business community as the "way to conduct business." Out of 108 respondents, 45 are using or plan to use EDI in the future. The average size of the small business respondents generally had a total yearly revenue of less than $10 million; of which approximately twenty-five percent was the result of Government contracts. Respondents indicated that EDI trading partners were expected to increase within their particular industry. The most significant document planned for conversion to EDI was the contract award and the large majority indicated that the use TELEX and FAX was going to be their first step toward implementing EDI.

EDI implementation is being driven by several factors. EDI implementation within small businesses is largely customer driven which may be interpreted as evidence of hub-driven EDI. Hub-driven EDI is a method of implementing EDI used by many large corporations with their supplier base. Essentially, the large corporation mandates the use of EDI with its suppliers

base and becomes the "hub" of all EDI activity for transactions between trading partners. The key benefits of EDI, as perceived by small businesses, are lower document handling costs, reduced lead times, and better accuracy. The major constraint for EDI implementation with small businesses was the perceived cost of initial implementation; even though EDI users indicated that actual costs were not excessive. EDI TPA's and VAN's were used by almost all respondents using EDI in establishing trading partners.

The next chapter will discuss the results of interviews with several major contractors that have developed an EDI business relationship with their small business suppliers. The author will identify common lessons learned by these corporations in their efforts to implement EC/EDI with small business suppliers in the pre-award acquisition process. The results of these interviews will be to extract any lessons learned that may have application to DoD's implementation of EDI with small businesses.

VI. LESSONS LEARNED

A. INTRODUCTION

Several major corporations conducting EDI business transactions with small businesses were examined during this research effort. These corporations provided their lessons learned from implementing EDI with their small business supplier base. These lessons learned will be utilized in recommending EDI implementation solutions to DoD and DoN.

The author has examined these corporations by focusing on the following two areas:

- How have these corporations required small business suppliers to adopt EDI?

- How successful have they been in their efforts to have small business suppliers adopt EDI?

B. BACKGROUND

Corporations currently utilizing EDI had made an initial strategic decision that an EDI business strategy was to be used as a tool to re-engineer their business procedures. Implementation of EDI by these corporations is seen as a powerful tool for businesses to maintain their market position due to increased competition. These corporations conducted cost/benefit analyses and established objectives for EDI implementation to convert their business transactions from paper to an electronic form.

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Big and small businesses are realizing that the cost of firm-to-firm transactions can be dramatically reduced through the use of EDI. [Ref. 34:p. 2]

In most instances, utilization of an EDI technology is now seen as a means to support business strategy and to gain a competitive advantage in the marketplace. Corporations that were EDI capable utilized two basic approaches in justifying EDI involvement in their business strategy. These two approaches are as follows:

- Proactive. Fully integrate business applications to achieve maximum benefit. Consider the entire business cycle in planning EDI; and

- Reactive. Responding to a trading partner's demands and need a quick-fix. This approach uses EDI software to convert existing business applications to an EDI format, this was viewed as the least impact approach. [Ref. 36:p. 127]

The majority of the major corporations interviewed utilized the proactive approach to implementing EDI. The next section will discuss the lessons learned by several large corporations.

C. LESSONS LEARNED

The lessons learned indicate that most small businesses go through three phases when implementing EDI:

1. FAX-like: Usually PC based with little or no application integration;

2. Application Interface: Application to application EDI transactions flowing between trading partners; and

3. Processes simplified and integrated: Transition from "paper-based" transactions to inter-enterprise concepts.

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> Data moves only once, eliminates redundant flow of information. [Ref. 37:p. 186]

Implementation of EDI with small businesses was generally conducted on an incremental process. The following lessons learned were found to be quite similar from one corporation to another and therefore will be presented in a consolidated format. Lessons learned from EDI implementation with small business suppliers are as follows:

- Conduct small business supplier base training and educate vendors every six weeks to identify problems and devise solutions. Ensure trading partners are qualified prior to conducting EDI business transactions. Software supplier and VAN representative must attend training to facilitate a common understanding and solution to the problem;

- Involve lawyers and audit personnel from the beginning to develop generic TPA's and procedure statements. Use TPA's to allocate liabilities (i.e., errors, disrupted transmissions);

- Establish a proper tracking system to ensure a verifiable audit trail is established before bringing up the first customer;

- Centrally locate "one" area to be responsible for technical problems. Have a dedicated help desk;

- EDI reduces the "bliss" of the arm's length relationship between supplier and customer. The internal processes of the trading partner must mesh with the customer; otherwise "bad" processes automated electronically make things exponentially worse;

- Business process re-engineering begins upon EDI implementation and requires dedicated project management from both companies. As such, EDI implementation took much longer than originally forecasted, due to both technical process and business process re-engineering issues. If companies or their personnel are resistant to changing their internal procedures to adapt to an EDI environment, costs will increase;

- Use a VAN. Qualify VAN and translation software companies to determine their policies over lost transmissions,

errors, etc. Utilize VAN and software companies to provide technical support to suppliers and customized application software support;

- Cost savings, related to good business processes converted to EDI, accrue in much larger proportion to the buyer than the seller; and

- Each trading partner is a small project and must be customized.

The aforementioned lessons learned were the result of interviews and presentations provided by several corporations. [Ref. 38 - 42] Lessons learned by the corporations were quite similar and all of them indicated that complete EDI implementation with a large number of small businesses was extremely time consuming and difficult. However, one corporation, the R. J. Reynolds Tobacco Company (RJR), (based in Winston-Salem, North Carolina), has succeeded in sending all of its purchase orders via an electronic data interchange service.

Beginning 1 April, 1993, RJR became completely reliant upon EDI to conduct purchasing. RJR sends all of its purchase orders via a VAN (i.e., BT North America, Inc.) and uses Sterling Software's "GenTran EDI" software package to translate all business documents into an ANSI X12 format. Due to RJR's one-hundred percent conversion to EDI in the purchasing arena, they expect to save $5.3 million annually [Ref. 43:p. 4]. With the previous paper-based purchasing system, RJR estimated that it cost from $75 to $125 to process

each purchase order. Since converting to EDI exclusively, the cost to produce a purchase order is 93 cents.

> You wouldn't believe the work load involved with a paper system. We had four employees just doing the mailing and filing. We filled 86 five-drawer file cabinets each year. [Ref. 43:p. 4]

By switching exclusively to purchasing via EDI, RJR was able to discontinue operation of its paper-based procurement methods and, thereby, further reduce overhead costs [Ref. 42]. Purchase orders generated by the paper-based purchasing method used to take up to three weeks to reach an international supplier and up to two weeks to reach a domestic supplier, however, with EDI, 40% to 45% of the transactions now arrive at the supplier within an hour, and the remaining orders within the same day. [Ref. 43:p. 4]

RJR estimates that it transmits 93,000 electronic procurement related documents to its supplier base of 1,428 vendors annually. Approximately 11,000 of these procurement documents are transmitted via EDI and then converted by the VAN's mainframe computer into a FAX document. By converting these EDI documents to a FAX, RJR reaches many of the smaller companies that were reluctant to invest in EDI hardware, software, and training.

RJR credits the ability to incorporate FAX as a crucial element to achieving 100% supplier responsiveness via EDI. The EDI/FAX conversion also eliminated parallel paper-based purchasing methods and procedures [Ref. 42]. Prior to usage

of the EDI to FAX service, RJR had 85% to 86% of all documents transmitted via EDI. RJR's decision to utilize an EDI service bureau (i.e., EDI Masters, Inc.) to integrate the remaining non-EDI suppliers into RJR's EDI purchasing system, allows any type of business, either small or large, to exchange business documents by FAX or overnight courier. Figure 4 displays how a supplier without any EDI experience or knowledge can work with an EDI service bureau and both receive and transmit business documents with customers dependent upon purchasing with EDI.
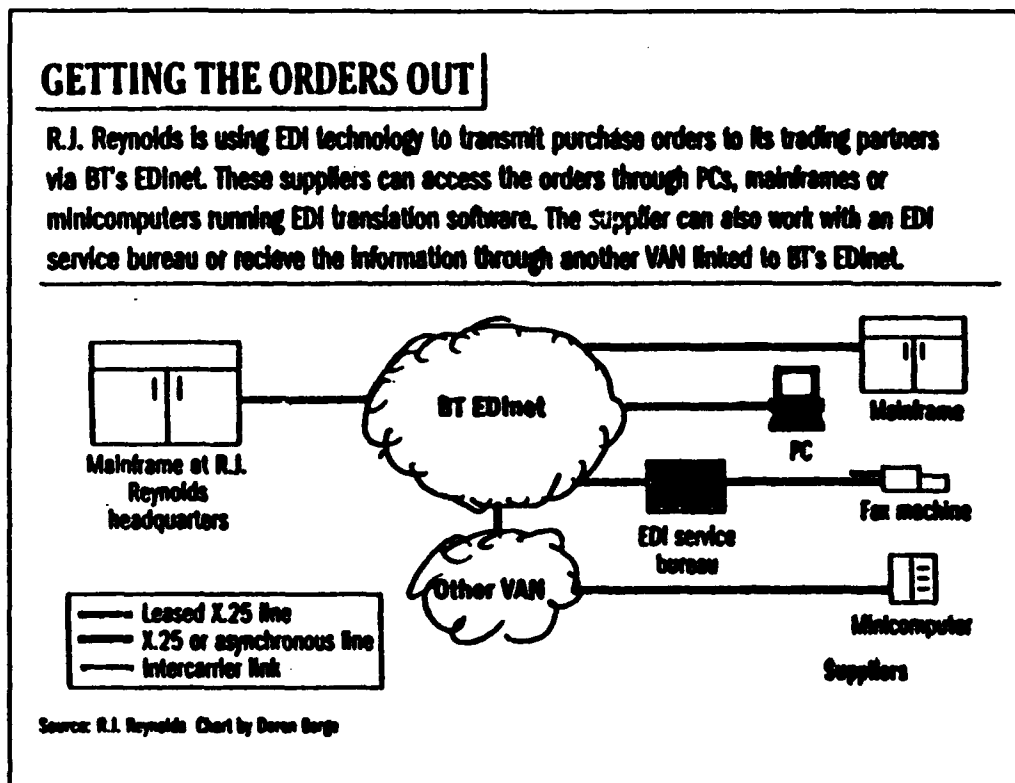

Figure 4. Getting The Orders Out

The EDI service bureau provides services to businesses that will benefit from the usage of EDI but cannot justify, 1) the volume of EDI transactions in order to purchase the necessary equipment; 2) have little in-house knowledge to implement EDI; or 3) cannot afford the initial expense of implementing EDI. The EDI service bureau provides to each customer the receipt, generation, interpretation, and processing of all transaction documents in compliance with ANSI X12 transaction sets. [Ref. 44] There are several EDI service bureau's nationwide that provide these types of services for their customers at very reasonable and competitive rates. In fact, RJR shares some of the initial set-up costs with their suppliers who wish to utilize the EDI service bureau [Ref. 42]. By incorporating FAX with EDI, RJR is now one of the few companies to use EDI for one-hundred percent of its purchasing operation. [Ref. 43:p. 4]

The next chapter will analyze the researcher's findings outlined in the previous chapters, in the context of DoD's efforts to motivate small business suppliers to implement the use of EC/EDI in the pre-award acquisition process.

VII. ANSWERS TO THE RESEARCH QUESTIONS

A. OVERVIEW

The purpose of this thesis was to answer the primary research question: How can DoD successfully implement the use of EC/EDI with small businesses in the pre-award acquisition process?

In pursuit of this objective, the author will analyze the data presented in the preceding chapters in the context of the following subsidiary questions:

- What is EDI and what are the current applications with small businesses?

- What is the range of pre-award acquisition activities to which EDI can be applied?

- How do large corporations utilize EDI with small business sub-suppliers and what lessons learned can be applied to DoD implementation of EDI?

- What are the significant barriers to implement a full range of pre-award acquisition activities through use of EDI?

- What actions can be taken to eliminate or reduce these barriers?

- What steps can be taken to enhance the use of EDI in the pre-award acquisition environment?

B. RESEARCH QUESTIONS ANALYSIS AND ANSWERS

1. What is EDI and what are the current applications with small businesses?

EDI is the process of electronically transferring formatted business transactions in a standard format from one organization's computer to another. [Ref. 6:p. 2] EDI is a form of electronic communication that allows trading partners in one or more organizations to exchange business data in structured formats that can be processed by application software; enhancing the productivity and effective use of timely and accurate business information.

Overall EDI activity as indicated by the survey results, indicates that 45 out of 108 respondents (i.e., 41.67%) are using, or plan to use, EDI in the future. The survey provided strong evidence that small businesses in the U.S. are committed to EDI and further that EDI will increasingly become part of their overall business strategy. The researchers findings are based upon observations of several key factors in the survey:

- Respondent firms indicated significant growth in the number of EDI trading partners, (i.e., 81.25%);

- Respondents expect to convert many non-EDI documents to standard EDI formats; and

- Respondents indicated that a significant portion of their TELEX and FAX transmissions will be converted to EDI, (i.e., 97.70%).

Respondents indicated that the primary application of EDI within their business organization would be in the pre-award acquisition process. Survey data indicates that the top business transaction currently being used by EDI users is the contract award. Similarly, respondents planning to use EDI,

as well as those not using EDI at all, indicated that the contract award document would receive the highest priority for conversion from paper to EDI. As such, the current applications of EDI with small business are concentrated in the pre-award acquisition process. Therefore, DoD and DoN should concentrate their efforts to foster implementation of EDI with small businesses in the acquisition arena.

2. What is the range of pre-award acquisition activities to which EDI can be applied?

Chapter III provides a detailed description of the range of EDI activities that can be applied in the pre-award acquisition process. Both simplified purchasing procedures and formal advertising contracting techniques are discussed along with current EDI initiatives in the pre-award acquisition process. Basically, it is clear that EDI can be applied to the full range of pre-award acquisition activities from acquisition planning to actual contract award.

3. How do large corporations utilize EDI with small business sub-suppliers and what lessons learned can be applied to DoD implementation of EDI?

Chapter VI presented many examples of lessons learned that can be applied by DoD in implementing EDI within its small business supplier base. Several of the lessons learned that can directly assist DoD in implementing EDI in the pre-award acquisition process are as follows:

- Conduct small business supplier base training and educate vendors every six weeks to identify problems and devise solutions. Ensure trading partners are qualified prior to conducting EDI business transactions. Software supplier and VAN representative must attend to facilitate a common understanding and solution to the problem;

- EDI reduces the "bliss" of the arm's length relationship between supplier and customer. The internal processes of the trading partner must mesh with the customer; otherwise "bad" processes automated electronically make things exponentially worse;

- Use a VAN. Qualify VAN and translation software company to determine their policies over lost transmissions, errors, etc. Utilize VAN and software companies to provide technical support to suppliers and customized application software support;

- Each trading partner is a small project and must be customized; and

- Usage of an EDI service bureau will allow all potential suppliers wishing to do business with DoD the opportunity to do so without investing in EDI hardware, software, or training.

Based upon the results of the small business survey, eighty-seven percent of the small businesses were "very likely" to use TELEX or FAX as the first step in establishing electronic communication with their trading partners, (Refer to Table VII). The survey indicates that the use of TELEX and FAX telecommunication methods for exchanging business transactions has been accepted by the vast majority of the small business suppliers.

As discussed in Chapter IV, both TELEX and FAX transmissions are now accepted as legal and binding contracts by Government procurement regulations as well as by the GAO and the judicial court system. As such, the utilization of an

EDI service bureau, that provides EDI services to integrate a small business into DoD's VAN or any other major customer's VAN is ideal based upon the broad level of acceptance of TELEX and FAX as both legally and commercially sufficient. Therefore, DLA and DoN should consider utilization of EDI service bureaus to help small business suppliers implement EDI and minimize the transition involved in going from paper-based to electronic transactions.

4. **What are the significant barriers to implement a full range of pre-award acquisition activities through use of EDI?**

The significant barriers to implementing EDI within the pre-award acquisition process include a lack of EDI knowledge and initial investment. These barriers to EDI implementation with small businesses will be analyzed in conjunction with the results of the survey data and the lessons learned from private industry presented in Chapter VI.

a. Lack of Knowledge

In today's continually changing and volatile economic environment, any new investment or expenditure of funds must provide a satisfactory return on investment. Small businesses, in particular, are hesitant to change their methods of conducting business in favor of a new technology (i.e., EDI) that would require capital investment and fundamental changes in their traditional methods of business

management. However, unless small businesses are educated to recognize the fundamental shift in business transactions away from a paper-based system to an electronic commerce method, implementation of EDI will take place very slowly.

> The question is not simply one of whether the small business will own a microcomputer; it is one of whether the small business will understand EDI concepts and technology. This is an educational and maturation process that may take some time; but, just as the public previously adapted to and accepted telephones, facsimile machines, automated tellers, direct deposit of funds, and PC's, EDI will become a way of doing business. [Ref. 2:p. 4-9]

Congress has mandated that it is Government policy to aid, assist, and counsel small businesses in obtaining Government contracts and, thereby, foster socio-economic policies and regulations. The SBA, DoD small business programs, and Procurement Technical Assistance Centers (PTAC) currently provide these services to small businesses and, as such, must be used as a vehicle in furthering EDI education. The results of the data presented in the survey indicated that the number one barrier restricting EDI implementation was a lack of understanding regarding the benefits and capabilities of EDI. As such, this lack of EDI knowledge is the result of the Government's inability to focus and deal with the greatest barrier to EDI implementation.

The DLA has developed an Small Business EDI Implementation Handbook, as well as a videotape and floppy diskette training packages, to help educate small businesses on the benefits and capabilities of EDI. The author was

impressed with DLA's efforts to spread the knowledge about EDI; however, even with DLA's efforts more effective and targeted training must be conducted.

DLA as the executive agent for EDI implementation within DoD has recognized this deficiency and requested assistance from the SBA. Even though the SBA was created to foster, educate, and improve small businesses ability to compete and receive Government contracts, SBA has in reality shown little if any interest in providing and fostering the needed training. In fact, the author's attempts to obtain any type of training or documentation regarding EDI from the SBA resulted in no relevant information. SBA referred the researcher to a SCORE (Senior Core of Retired Executives) representative who was proficient in computer technology but not in EDI opportunities for future Government contracts.

Effective training and sponsorship (i.e., support) of EDI by DoD, SBA, and each of the Armed Services will not only greatly reduce the barriers to EDI implementation but will also reduce the fear and anxiety that comes with organizational change. Effective EDI training can be a powerful tool in managing and minimizing organizational resistance while maximizing management commitment. Even though the survey data provides strong evidence that small businesses are committed to EDI, respondents still indicate that a lack of knowledge is their number one barrier to EDI implementation. Additionally, respondents indicated that the

lack of trading partners willing to conduct EDI business transactions was a "very critical" constraint to implementation of EDI. As such, effective EDI training of small businesses is considered the most significant barrier to EDI implementation.

b. Initial Investment

The results of the survey data provide evidence that respondents perceive the cost for EDI hardware, software, and training as an important constraint to the adoption of EDI. Respondents both planning and not planning to use EDI were furthered questioned on how much they felt was a justifiable initial investment and monthly communication charge for EDI implementation. Seventy-eight percent of the respondents indicated that this amount should as low as possible, generally less that $5000.00 (Table X).

To determine if EDI implementation was feasible for under $5,000.00, the author asked EDI users what was their total cost of EDI implementation. The results of the survey indicated that the actual cost to implement EDI was less than $3,500.00 for 77% of the respondents (Table XI refers). Even though respondents rated cost as a "very critical" barrier to EDI implementation, further analysis of the survey data indicates that implementation and maintenance costs were considered affordable and reasonable by those respondents using EDI. Therefore, DoD's implementation of EDI with small

businesses should not be restricted due to the actual costs, but rather the idea of the perceived costs which is interrelated to a lack of education and knowledge.

5. What actions can be taken to eliminate or reduce these barriers?

The DLA and DoN can take several actions in order to reduce the barriers to EDI implementation. The most significant barriers are the lack of knowledge by small businesses on the capabilities of EDI (i.e., the actual cost of EDI implementation) and the regulatory requirements.

a. Effective Training

These barriers to implementation can be eliminated by mandating effective EDI training by existing DoD and SBA organizations. These organizations should utilize the DLA training programs to ensure compatibility and standardization of all small businesses implementing EDI. Using this perspective, small businesses can be exposed to the benefits and capabilities of EDI through training, assist visits, and then be "nurtured" along until they either commit to EDI or be terminated as a supplier. Some of the methods recommended, including organizational responsibility, to achieve this level of commitment within small businesses are as follows:

- Mandate the SBA to provide EDI training at all of its field sites and incorporate EDI compatibility into their Certificate of Competency rating;

- DLA should specifically target grant funding provided to the Procurement Technical Assist Centers (PTAC) for EDI

training. DLA could require the PTAC's to provide EDI training to all of their clients as a prerequisite of obtaining DoD funding. This could provide an immediate increase in the number of small businesses that would be EDI capable;[2] and

• DoD should offer incentives to the program offices of each of the armed services to accelerate EDI implementation within their respective services by providing specific funds for small business EDI training.

Implementation of an effective training program is critical to the overall success and adoption of EDI by DoD's small business suppliers. Additionally, by providing effective training, a non-threatening forum can be created to discuss, evaluate, and deal with the concerns regarding EDI implementation.

b. Regulatory Requirements

Regulatory requirements are a significant barrier to implementing EDI since the intent and letter of the law must be followed until being actually changed or waived. The primary regulatory impediments are the FAR and WHPCA.

The FAR is rapidly becoming outdated by advancements in innovative management methods and technology. The FAR was developed and written when paper-based contracting methods were the sole means available to conduct business transactions. However, since the adoption of EDI by DoD many of the laws and regulations set forth in the FAR do not

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[2]. PTAC's are organizations partially funded by DoD to provide assistance to small businesses in obtaining Government contracts.

readily accommodate the full application of EC/EDI techniques; some even act as impediments. DLA should utilize the results of an in-depth analysis conducted by LMI [Ref. 27] to initiate legislative action to begin breaking down those regulatory barriers.

The WHPCA should be refined to continue to meet the intent of the law but provide for flexibility when conducting business in an EDI environment. Based upon the requirements of the WHPCA, the contracting officer must make a determination on whether a responsive offeror, that will receive a contract award, is in fact eligible to receive the award. In an EDI environment the offerors must provide this certification of eligibility within responses to the RFQ, IFB, or RFP. Survey respondents were questioned as to whether or not they were entered in the SBA's PASS system or if they had been assigned a CAGE code. Businesses that are assigned a CAGE code or have a PASS number have been certified to be either a small or large business as defined by SBA. The survey data indicates that 76% of all respondents had been assigned a CAGE code or PASS number. Additionally, the WHPCA requirement for certification has been met by the EASE bulletin board; which requires prospective offerors to register their businesses with the procuring organization prior to their submission of quotations. As such, responses to Government quotations through electronic bulletin boards

using EDI can be designed to sufficiently meet the provisions of the WHPCA.

6. **What steps can be taken to enhance the use of EDI in the pre-award acquisition environment?**

The use of EDI can be enhanced in the pre-award acquisition phase by taking several steps: to foster an effective EDI training program; reduce regulatory barriers as previously discussed; utilization of a VAN; use of TPAs; establish and provide access to a DoD EDI Help Desk; and access to an EDI service bureau for providing hands-on assistance.

Utilization of a DoD or commercial VAN along with a TPA would further reduce the uncertainties and fear involved with utilizing a new form of business communication (i.e., EDI). Seventy-nine percent of the respondents that used EDI indicated that they utilized a VAN. Additionally, 71% of the respondents indicated that they established a TPA with their trading partner to ensure all terms and conditions of their EDI participation are understood. Additionally, DoD could establish an EDI Help Desk to assist contractors that are having problems utilizing EDI with DoD, as well as, to provide information for businesses interested in becoming EDI compatible.

Drawing upon the lessons learned from major corporations implementation of EDI, use of an EDI service

bureau to bridge that first step into electronic commerce is crucial for a small business. One of the "somewhat critical" constraints identified by respondents was the lack of personnel to implement EDI. Use of an EDI service bureau would provide the small business with the expertise and knowledge to "get their foot in the door" of the electronic marketplace. Additionally, DLA or the appropriate service could share the initial implementation costs with the small business to further defray any large amount of initial investment.

The next chapter will present the conclusions and recommendations formulated by the researcher outlined in the previous chapters.

VIII. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

The purpose of this thesis was to determine how DoD can successfully implement the use of EC/EDI with small businesses in the pre-award acquisition process. As discussed, utilization of EC/EDI in the pre-award acquisition process is already happening at several procurement organizations throughout DoD. However, in order for DoD to successfully implement EC/EDI throughout its entire small business supplier base, certain key efforts must occur within DoD. These efforts are based upon several initiatives as follows:

- Provide effective training to all small businesses on the benefits and capabilities of EDI within their business and industry;

- Specifically direct grant funding to the PTAC's to provide an immediate increase in the number of small businesses that will be EDI compatible;

- Require the SBA to aggressively sponsor and implement EDI training for all small businesses currently registered on the PASS system and require certification of EDI training prior to being approved as a "small business concern";

- Draft legislation to modify or eliminate restrictive laws and regulations preventing EDI implementation; and

- Foster the use of VANs, TPAs, and EDI service bureaus and have DoD share these costs with the small businesses.

These efforts would provide the basic infrastructure to enable DoD to train, nurture, and problem solve small businesses once

DoD becomes totally reliant upon EC/EDI in the pre-award acquisition process.

B. RECOMMENDATION

Through evaluation and analysis of the findings, the following recommendation has been formulated:

- **DoD should develop a master plan to provide effective training to its small business suppliers to eventually require EDI implementation.**

This plan should have in place the following key elements prior to implementation. A discussion and analysis of each of these elements is provided in Chapter VII:

- reduce or eliminate regulatory barriers;

- establish a VAN or network of VANs to provide EDI services to the Government;

- establish generic TPAs for use throughout all of DoD;

- establish a DoD EDI Help Desk;

- provide recommendations or assistance in utilizing the services of an EDI service bureau; and

- congressional support.

C. RECOMMENDATIONS FOR FURTHER RESEARCH

Research conducted for this thesis has revealed the following areas for further research:

- Identify the impact of modifying specific Government rules and regulations to manage the transition to electronic data interchange environment;

- Perform a benefit analysis on a Government activity that has converted to purchasing with EDI and compare the benefits and costs of that system versus a similar paper-based purchasing system;

- Analyze the dynamics of strategic and organizational change in making the transition to an EC/EDI marketplace; and

- Focus on training and impact of EC/EDI on a small business initially and throughout implementation.

APPENDIX: SMALL BUSINESS SURVEY

ELECTRONIC DATA INTERCHANGE
SMALL BUSINESS SURVEY

INSTRUCTIONS:

- If you have knowledge utilizing EDI with other corporations or government agencies, please base your answers on your most recent experience.

- Return your completed survey in the enclosed envelope within 10 days. In the event the return envelope is misplaced, my return address is:

> Superintendent (Code 36)
> Naval Postgraduate School
> Monterey, CA 93940
> Attn: R. Sergeson

PART I: ORGANIZATIONAL BACKGROUND

1. Is your company designated as a "Small Business"? ___Yes ___No

2. Do you have a Commercial and Government Entity Code (CAGE)? ___Yes ___No
   If yes, what is your CAGE number:_____

3. Are you entered in the Small Business Administration's Procurement Automated Source System (PASS)? ___Yes ___No

4. What was your company's total revenue for your fiscal year 1992?
   ___ Below $200,000   ___ $11 - $25 million
   ___ $200,000 - $499,999___ $26 - $50 million
   ___ $500,000 - $999,999___ over $50 million
   ___ $1 - $10 million

5. What percent of your total revenue was from the U.S. Government?
   ___ Less than 10%   ___ 51 - 75%
   ___ 10 - 25%   ___ 76 - 90%
   ___ 26 - 50%   ___ over 90%

6. Which category below best describes the type of industry your company operates within:

___ Mining & Oil/Gas Extraction	___ Textiles
___ Apparel	___ Lumber/Wood
___ Paper	___ Printing/Publishing
___ Chemicals	___ Primary Metals
___ Machinery	___ Rubber
___ Transportation Equipment	___ Communications
___ Wholesale Trade - Durable	___ Utilities
___ Wholesale Trade - Nondurables	___ Retail Stores
___ Furniture/Fixtures	___ Finance
___ Electric/Electronic Equipment	___ Other (please specify):

7. Does your company currently utilize EDI to transfer business documents?
___Yes ___No   If yes, please proceed to question 17.

8. Does your company plan to implement EDI in the future?
___ Yes, within the next two years.
___ Yes, but not in the near future.
___ Never thought about it.   If no, please proceed to question 11.

9. How did the following factors contribute to the planned use of EDI? Please rate the factors on a five-point scale, (enter 5 if it is Very Important and 1 if it is Not Important at all or not applicable).
___ Customers request (as a condition to do business with them).
___ Reduce document handling costs.
___ Reduce production/delivery lead time.
___ Broaden supplier base.
___ Broaden customer base.
___ Better accuracy.
___ Other (please specify):

10. Do you have a priority for converting the following business documents from paper to EDI? Please rate your conversion priority as follows: 1 = top priority - planned immediately, 2 = planned within two years, 3 = low priority - planned but not in the near future, and lastly 4 = not planned.
___ Invoice
___ Payment Order/Remittance
___ Price Sales Catalog
___ Contract Award
___ Shipment Information
___ Specification/Technical Information
___ Other (please specify): _____

11. How important do you feel are the following constraints in delaying the adoption of EDI? Please rate the criticality of the constraints as follows: 1 = Very Critical, 2 = Somewhat Critical, and 3 = Not at all Critical.

___ lack of understanding of EDI benefits and capabilities.
___ lack of personnel to handle technology.
___ cost for EDI hardware/software and training.
___ concern for loss of paper audit trail.
___ concern for data integrity and security.
___ legal issues.
___ Other (please specify): _____

12. How much do you think is a justifiable initial investment for EDI software/hardware and training?
___ Under $5,000 ___ between $5,000-$10,000 ___ between $10,000-$20,000 ___over $20,000

13. How much do you think is a justifiable monthly cost for EDI operational maintenance (including telecommunication charges)?
___ Under $500 ___ $500-$1,000 ___ $1,000-$5,000 ___ $5,000-$10,000 ___over $10,000

14. Are you very likely, somewhat likely, or not at all likely to use Telex or FAX as the first step in electronic communication with your trading partners?
___ Very Likely ___ Somewhat Likely ___ Not at all Likely

15. Check the areas within your company that have any form of computerized support. Additionally, indicate whether the computerized support was developed in-house or purchased off-the-shelf.
___ Purchasing:
        * developed in-house ___* purchased off-the-shelf ___
___ Inventory Control:
        * developed in-house ___* purchased off-the-shelf ___
___ Manufacturing:
        * developed in-house ___* purchased off-the-shelf ___
___ Bidding/Order Entry:
        * developed in-house ___* purchased off-the-shelf ___
___ Distribution/transportation:
        * developed in-house ___* purchased off-the-shelf ___
___ Accounting:
        * developed in-house ___* purchased off-the-shelf ___

16. Please add any additional comments you may have, (after your comments please skip to question 31):

_____

_____

EDI OPERATIONS

17. How long has your company been using EDI? _____

18. EDI Trading Partners:
    a. How many EDI trading partners do you currently have? _____

    b. Was EDI forced upon your company as a condition to do business with a trading partner?
       ___ Yes   ___ No

    c. Have you required your suppliers to implement EDI as a condition to do business with you?
       ___ Yes   ___ No

    d. Do you utilize Trading Partner Agreements with your partners?
       ___ Yes   ___ No

    e. Are your Trading Partner Agreement uniform or tailored to each partner?
       ___ Uniformed   ___ Tailored

    f. Does your company anticipate significant growth in the number of EDI trading partners?
       ___ Yes   ___ No

19. EDI Transactions:
    a. What types of ANSI/X12 EDI transactions do you send/receive from your trading partners?
        (please circle as appropriate)

	SEND	RECEIVE
a. 511 Requisition	Yes No In Process	Yes No In Process
b. 810 Invoice	Yes No In Process	Yes No In Process
c. 820 Payment Order/Remittance	Yes No In Process	Yes No In Process
d. 832 Price Sales Catalog	Yes No In Process	Yes No In Process
e. 836 Contract Award	Yes No In Process	Yes No In Process
f. 840 Request for Quotation	Yes No In Process	Yes No In Process
g. 841 Specification/Technical o	Yes No In Process	Yes No In Process
h. 843 Response to RFQ	Yes No In Process	Yes No In Process
i. 850 Purchase Order	Yes No In Process	Yes No In Process
j. 855 Purchase Order Acknowlgmt	Yes No In Process	Yes No In Process
k. 856 Ship/Notice Manifest	Yes No In Process	Yes No In Process
l. 858 Shipment Information	Yes No In Process	Yes No In Process
m. 860 Purchase Order Change	Yes No In Process	Yes No In Process
n. 865 Purchase Order Change Ack	Yes No In Process	Yes No In Process
o. 869 Order Status Inquiry	Yes No In Process	Yes No In Process
p. 870 Order Status Report	Yes No In Process	Yes No In Process

    b. How many EDI transactions do you send and receive each month?
       Send: _____   Receive: _____

    c. Will EDI usage in your business and particular industry change in the next year?
       ___ Increase   ___ Not Change Significantly   ___ Decrease   ___ Unknown

20. Do you have a priority for converting the following business documents from paper to EDI? Please rate your conversion priority as follows: 1 = top priority - planned immediately, 2 = planned within two years, 3 = low priority - planned but not in the near future, and lastly 4 = not planned.

   ___ Invoice.
   ___ Payment Order/Remittance.
   ___ Price Sales Catalog.
   ___ Contract Award.
   ___ Shipment Information.
   ___ Specification/Technical Information.
   ___ Other (please specify): _____

21. How did the following factors contribute to the adoption of EDI? Please rate the factors on a five-point scale, (enter 5 if it is Very Important and 1 if it is Not Important at all or not applicable).

   ___ Customers request (as a condition to do business with them).
   ___ Reduce document handling costs.
   ___ Reduce production/delivery lead time.
   ___ Broaden supplier base.
   ___ Broaden customer base.
   ___ Better accuracy.
   ___ Other (please specify):

22. How important do you feel are the following constraints in delaying the adoption of EDI? Please rate the criticality of the constraints as follows: 1 = Very Critical, 2 = Somewhat Critical, 3 = Not at all Critical).

   ___ Lack of understanding of EDI benefits and capabilities.
   ___ Lack of personnel to handle technology.
   ___ Lack of trading partners willing to conduct EDI transactions.
   ___ Cost for EDI hardware/software and training.
   ___ Concern for loss of paper audit trail.
   ___ Concern for data integrity and security.
   ___ Legal issues, (i.e, usage of EDI transactions and electronic signatures as legally enforceable business documents).
   ___ Other (please specify): _____

23. What was the total cost of EDI implementation within your company, (i.e., estimated cost of hardware, software, training, etc.)?

   ___ Under $1,000
   ___ Between $1,000-$3,500
   ___ Between $3,500-$7,000
   ___ Over $7000
      a. How did your implementation cost compare with your initial estimate?
         ___ Higher than initial estimate.
         ___ Approximately the same as initial estimate.
         ___ Lower than initial estimate.

24. Do you currently use a third-party Value-Added-Network, (VAN), to support your use of EDI? ___Yes ___No ___Undecided

    a. If not, are you aware of the support services provided by a VAN, (i.e., electronic mailbox, translation, encryption, security, etc.)? ___Yes ___No

25. If a VAN is used, what services are utilized?
    ___transmission only
    ___transmission plus mailbox

26. What is your monthly (or annual) VAN communication charge? $ _____
    a. Do your trading partners pay their share and if so how much? ___Yes ___No $ _____

27. Did your company purchase or develop in-house translation software to support your EDI program? ___ Purchase ___ Develop

    a. If purchased, what brand and version of software do you use?
    (please specify):_____

28. Check the areas within your company that have any form of computerized support. Additionally, indicate whether the computerized support was developed in-house or purchased off-the-shelf.
    ___ Purchasing:
        * developed in-house ___* purchased off-the-shelf ___
    ___ Inventory Control:
        * developed in-house ___* purchased off-the-shelf ___
    ___ Manufacturing:
        * developed in-house ___* purchased off-the-shelf ___
    ___ Bidding/Order Entry:
        * developed in-house ___* purchased off-the-shelf ___
    ___ Distribution/transportation:
        * developed in-house ___* purchased off-the-shelf ___
    ___ Accounting:
        * developed in-house ___* purchased off-the-shelf ___

29. Which of the functional areas have an integrated EDI capability?
    ___ Purchasing
    ___ Inventory Control
    ___ Manufacturing
    ___ Bidding/Order Entry
    ___ Distribution/Transportation
    ___ Accounting

30. Please add any additional comments you may have:

_____

31. May I call for a follow-up interview?   ___Yes   ___No

32. Your Name: _____

33. Your Title: _____

34. Name of your Company: _____

35. Telephone Number: _____

36. FAX Number: _____

Thank you for taking the time to complete this survey. Your efforts are most appreciated. Information collected will assist in DoD's implementation of EDI with Small Businesses.

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